SOUTHERN RHODESIA.

REPORT

OF THE

Secretary, Department of Agriculture,

For the Year 1927.

Presented to the Legislative Assembly,
1928.

Salisbury, Rhodesia:
Printed by the Government Printer.

[C.S.R. 15—1928.] 1928. 884—600.28

SOUTHERN RHODESIA.

Report of the Secretary, Department of Agriculture, for the Year 1927.

Presented to the Legislative Assembly,
1928.

I have the honour to submit my report for the year ended 31st December, 1927.

General.—During the year under review the demands on the staff have been exceptionally heavy, and at times it has been difficult to meet all requests made by the farming community for information and advice. New settlers in particular require guidance and assistance, and whilst it is admitted that the Department cannot fully meet all the demands made, this is in no way due to the members of the staff, who do not spare themselves in their efforts to help all those carrying out agricultural pursuits or stock farming.

In order to make the best use of the technical staff it is very desirable that farmers' associations should do their utmost to co-operate with and assist the Department. It is not infrequent that requests for expert advice are received from individual farmers in areas recently toured by officials of the Department, and if it is at all possible, farmers should endeavour to make use of experts when they are in their district. At the beginning of the year all farmers' associations were circularised and informed that it was proposed that technical officers would make two or three tours of each district during the year and give lectures or demonstrations where desired. It was then suggested that local farmers' associations might select farms for carrying out demonstrations which would have been useful and instructive, but for some reason the general desire seemed to have been to get officials to attend farmers' meetings. As there is frequently a good deal of general discussion at these meetings not always relating to farming, more valuable advice and assistance might be obtained from practical demonstrations and discussions carried out on the land. The reasons for and against different methods of farming can best be explained and discussed when results, good or bad, can actually be seen by those desiring information, and for this reason farmers' meetings may not always be the most suitable place for dealing with matters relating to the growing of crops, or other matters pertaining to farming. Farmers are, therefore, asked to consider the methods of expert advice likely to give the best results, and any suggestions put forward which are likely to assist in this direction would be welcomed.

CROPS, 1926-1927.

As was anticipated, the maize and tobacco crops were the highest on record, totalling 1,659,447 bags, and 19,175,000 lbs. respectively. Ground nuts also showed an increased acreage and yield.

Maize.—The average yield of maize per acre, of approximately 6.2 bags, is higher than usual, but with better farming this average might still be considerably increased. In the maize competition plots the average yield worked out at something over 22 bags per acre, and maize growers would be well advised to give more attention to the question of obtaining a better return per acre from their crops. There are many reasons for low yields of maize, and amongst these might be included low rainfall, poor or starved soil, dirty lands, due probably to the grower planting out a bigger acreage than can be properly worked, planting too close, with the result that the cobs are stunted and in many cases no cobs form. The latter is not an uncommon fault with new growers, many of whom seem to think the closer they plant the heavier the yield will be. As maize competition plots are entered from most districts, much valuable knowledge could be obtained from visiting these plots and studying the methods of planting, spacing, cultivation, manuring and general treatment of the crop. When it is remembered that entries for the maize growing competition plots include many well-known successful growers, it will be realised that these farmers are not yet satisfied that they are getting the best possible return from their land, and other less successful growers and new settlers who propose to grow maize could profitably follow the example of those who continue to carry out

experiments to enable them to get a higher yield per acre. The work done by the Rhodesian Maize Growers' Association, in connection with maize growing competitions, is deserving of the highest praise. Much time and thought is given to the work, and the educational results being obtained are most valuable.

Ground Nuts.—The average yield of 8 bags of ground nuts per acre is, as stated in the Chief Agriculturist's report, unduly low. On the Government Gwebi Farm the average yield obtained was 20 bags per acre, and the land on this farm is not by any means outstanding for the growing of monkey nuts. The crop should show without difficulty an average of over 10 bags per acre, and a little more attention would probably produce a heavier average yield and provide a more remunerative return to the grower. It is, of course, possible that numbers of farmers are merely planting a few acres to see whether their land will grow ground nuts, and little care or attention is given to the crop after planting. A small acreage well done would, however, give better results, and prove a more reliable test than a larger area which has been more or less neglected. To grow any crop successfully the best methods of farming must be followed, and the growing of ground nuts is no exception to this rule.

Tobacco.—The tobacco crop of 19,175,000 lbs. exceeded the previous best yield by 13,861,814 lbs. Unfortunately, the increase in the production was so rapid that there is likely to be difficulty in satisfactorily disposing of the crop. As in the case of the cotton boom two years ago, the Department urged moderation in the planting of tobacco, but when it becomes known that numbers of growers have disposed of a crop such as tobacco at highly remunerative prices, it is almost inevitable that many established farmers and new growers will apply themselves to growing the popular crop, with the result that production must increase for a time by leaps and bounds and the market gets flooded.

It is hoped when recognised brands of Rhodesian tobacco and cigarettes are seen on the market that the demand for the Rhodesian product will increase sufficiently to absorb the crop. Many letters have appeared in the Press, and numerous suggestions have been made as to the best methods for improving the position. Although a few brands made from pure Rhodesian leaf may be available, this side of the business will have to expand considerably before any appreciable demand for the leaf can be expected. It will be realised that the tobacco crop of this Colony is a very small proportion of the world's production, and if the taste for Rhodesian-grown leaf could be developed, and good brands were available at a moderate price, there seems no reason why there should not be a greater demand than at present for the Rhodesian product. Large manufacturers no doubt hold big interests in American tobacco, and they would naturally be disinclined to do anything likely to adversely affect these interests, and whilst they could no doubt absorb a certain amount of Rhodesian leaf for blending, they are unlikely to take active steps to push brands made entirely from Rhodesian-grown tobacco until the public demand such brands. The question of obtaining a market in the meantime is a difficult one, and it is doubtful whether an early solution of the difficulty is likely to be found.

The whole question is one of supply and demand, and to suddenly create a demand sufficient to absorb the whole of the Rhodesian output is hardly possible. When good brands of Rhodesian tobacco and cigarettes are on the market, however, a more intensive campaign will no doubt be instituted with a view to pushing the sales of such brands and thus create an increased demand for Rhodesian leaf.

Cotton.—It was not anticipated that there would be any increase in the cotton crop, but satisfactory progress is being made at the Cotton Seed Breeding Station at Gatooma, and there is every possibility of breeds suitable to Southern Rhodesian climatic conditions being established, and when that stage is reached, more attention no doubt will be paid by farmers to this crop.

Wheat.—The growing of wheat is receiving more attention from farmers with suitable land, and it is hoped that more will be done to extend the acreage of this important crop. Many experiments have, and are still, being made by the Department with different varieties of seed, and no doubt further varieties, suitable for the conditions of the Colony, will eventually be established.

Other crops grown are more in the nature of side lines, and are produced more for home use than for export, with the exception of potatoes, for which there are occasional demands from adjoining countries.

Attention might again be drawn to the value of sweet potatoes for stock feed, and it is surprising that this crop is not more generally grown for dairy stock and pigs.

The total area under cultivation for summer crops for the year 1926-1927 was declared at 346,083 acres, as against 355,500 acres for the previous year. The report and statistics of summer crops grown by Europeans for the season 1926-1927 will be found in a bulletin issued by the Government Statistician and also in the March issue of the *Rhodesia Agricultural Journal.*

CATTLE.

The price for good slaughter cattle has advanced appreciably during the year, but the price offering for poor classes of stock has shown little or no improvement. Good dairy stock has been in demand, and for this class of animal very good prices are being realised. A good deal of culling has been done in dairy herds and also amongst beef breeds. The effect of this will gradually become more

noticeable, and by keeping better animals in both breeds cattle owners will find they are working on a sound and more profitable basis. The export figures for the year show a considerable falling off, but this was not unexpected, as, on account of the dry season, it was almost impossible to send any cattle to the Union for slaughter purposes for overseas markets after the end of May. In the previous year a large number of animals was exported on the hoof *via* Messina by the Cold Storage Company, and no doubt had grazing been available a similar number might have been sent out of the country during 1927, but, as stated above, lack of feeding along the stock routes restricted the export total for the overseas markets.

The totals of cattle exported during the last six years are as follows:—

1922	23,938
1923	34,841
1924	50,770
1925	60,545
1926	74,646
1927	46,898

For the purpose of comparison, the cattle exports to different centres for the last three years are shown hereunder:—

	1925.	1926.	1927.
Union of South Africa	9,591	12,250	7,244
For slaughter for overseas (Imperial Cold Storage) ...	35,675	49,595	16,246
To England (on hoof)	236	310	200
Belgian Congo (for slaughter)	4,768	9,016	20,320
Belgian Congo (trek oxen)	383	...	...
Belgian Congo (for breeding)	9,269	2,829	1,322
Northern Rhodesia (for breeding) ...	85	32	219
Portuguese East Africa	538	614	1,347
	60,545	74,646	46,898

Statistics of Live Stock and Animal Products for the Year 1926.—This information will be found in Bulletin No. 646, published by the Department in June, 1927, and obtainable on application to the Government Statistician, and will also be found in the *Rhodesia Agricultural Journal* for the month of June, 1927.

SHEEP EXPERIMENTS.

The sheep experiments being carried out have not been altogether successful, but this has been due more or less to the advice given with regard to proper treatment of the sheep not having been followed. Where care has been exercised to dose sheep regularly for wire worm, to provide sufficient succulent feed and to prevent the animals from drinking from pools of stagnant water, the results have been entirely satisfactory. The lessons learnt during the year, however, will prove valuable, and the coming year will probably show much better results. Many parts of the country are undoubtedly suitable for sheep, but this class of animal requires probably more care and attention than is generally appreciated, and until sheep owners realise this, headway in sheep farming will be slow, and losses are likely to be heavy.

TECHNICAL BRANCHES OF THE DEPARTMENT.

As has been the practice for the last two years, the reports of the officers in charge of the different branches of the Department are appended hereto. These reports deal fully with the work and operations carried out during the year.

Chief Agriculturist's Branch. — This branch of the Department deals with all matters relating to crops and agriculture generally, and the Chief Agriculturist is generally responsible for the efficient working of the Matopo and Gwebi farms, and also the Agricultural and Tobacco Experiment Stations in Salisbury.

It will be noted that in his report the Chief Agriculturist draws attention to the desirability of growing more legumes for green manuring, particularly in Matabeleland. It may be considered that in many parts of Matabeleland the rainfall is so light that the growing of crops in any quantity is hardly justified, but a very good example of what can be done with a short rainfall may be seen at the Municipal Experiment Station at Bulawayo. This station gives an excellent illustration as to what sound farming methods can do, not only in favourable but also in unfavourable seasons. The results obtained there are a credit to the manager, and the Bulawayo Municipality are to be congratulated on the good work they are carrying out.

Another important matter touched on by the Chief Agriculturist is the general lack of hay cutting by owners of stock. In an unfavourable season many animals which die from poverty might be carried through by the provision of a few stacks of hay. The expense of cutting hay is not a heavy item, and salt is not costly, so there is no great reason why farmers should neglect this important feed for stock and which is most essential for animals in poor condition during the winter months. The value of the number of animals saved would in most cases far exceed the cost of providing the necessary hay.

Interesting information concerning the costs of growing different crops at the Gwebi Farm will be found in the report, and although no amount is included for European labour or supervision, interest on capital invested in land, stock or implements, or for depreciation, the figures shown are valuable. No doubt at a later date a more elaborate system of costing will be introduced, and this should be of the greatest value in showing generally the profitable and unprofitable sides of farming under local conditions.

Sheep have not proved successful on the Gwebi Farm, and it may be considered advisable to drop this class of stock on the farm in the meantime and extend operations in other directions. It is likely that sheep will do better on the Matopo Farm than at Gwebi, as the veld at the former is more suited to this class of stock.

Valuable work has been carried out by the Horticulturist, who is also highly efficient in citrus and deciduous fruit culture. Growers can now be advised as to the varieties of trees most suitable to Southern Rhodesia, and full advantage is being taken of the official responsible for advisory work on this side of the Chief Agriculturist's branch.

The Agricultural and the Tobacco Experiment Stations are carrying out most useful experiments, and full advantage of these stations is taken by farmers and much valuable information is obtained.

It will be noted that enterprising farmers in Melsetter district are experimenting with coffee and tea plantings, and if these industries can be established, the benefit to a district situated so far from a railway will be of the greatest value. The cost of transportation of heavy and bulky crops, such as maize, from Melsetter district is prohibitive, and the results obtained from the experiments now being carried out with coffee and tea will be awaited with interest.

The sugar cane experiments in Wankie district are being extended, and in the near future it is likely that considerable developments will take place in this new and promising industry.

During the coming year it is hoped to carry out experiments with farm tractors equipped with producer gas attachments. Whilst on leave during the year the Chief Agriculturist attended demonstrations carried out with this plant in England, and was so favourably impressed with the results that arrangements were made to test the plant and other labour-saving devices locally. These demonstrations will, it is hoped, be conducted on the Gwebi Government Farm at an early date.

Stock Adviser's Branch.—From the report of the Stock Adviser it will be seen that more care is being exercised in the selection of animals, and it is evident farmers realise that poor class animals are a liability, and that it only pays to keep good beasts. On the recommendation of the Stock Adviser a good deal of culling has been done in some herds, and in other cases herds have been graded by the Stock Adviser, with the result that the owners know their profitable and unprofitable animals. There is a steady demand for good bulls and dairy cows, and these are difficult to obtain.

It will be noted from the return of animals purchased under the Government Loan Scheme that the favourite breed at present is Frieslands, and this breed accounts for slightly over 50 per cent. of the animals purchased.

Dairy Branch.—From this report it will be seen that farmers carrying out dairying operations had many adverse conditions to contend with during the year, but in spite of this the industry has made progress. Heavy frosts in May, June and July did much damage to the natural winter grazing, and, as stated by the Dairy Expert, such winter feed as had been conserved was in many cases all too quickly consumed. The lesson from this has, no doubt, in numerous instances, been taken to heart, and a better reserve of winter feed will be provided to guard against conditions such as those encountered last year. It must be remembered that dairy stock, probably more than any other breed of cattle, require good warm housing and feed in the winter, and unless this is provided, the milk supply must decrease and profitable dairy cattle are likely to become a liability to their owners.

It is noticeable that farmers are giving rather more attention to milk recording, and this is a most necessary essential where dairy cattle are concerned. Better cows and better feeding will amply repay the dairy farmer, and the farmer who does his good cows well is bound to obtain a better return than the man who relies on double the number of veld-fed animals for his milk supplies. Milk recording will very soon show the profitable cows in herds, but this must be carried out under proper supervision.

The road motor services will prove of the greatest value to dairy farmers in districts in which these services are operating, and as dairy methods improve, the support to these services is likely to increase.

The reason for the decrease in cheese making in the Colony is explained by the Dairy Expert, and it will be noted that cheese costing 1s. 1d. per lb. to make in the Union could be bought in Durban at from 8d. to 9d. per lb., and could be landed in Bulawayo at about 10d. per lb. In view of this state of affairs it was more profitable for dairy farmers in Southern Rhodesia to send their cream to a creamery rather than continue their cheese making operations. Later in the year there was an acute shortage of cheese throughout South Africa, with the result that the price appreciated beyond the actual value of the product. This state of affairs is unsound and unsatisfactory both for the dairy farmer and the consumer, but last year's experience will probably cause more care to be exercised to prevent a similar situation arising.

The pig industry is making satisfactory headway. Good prices have been paid by local factories for bacon pigs, and in addition to local requirements, over 2,000 pigs were exported, chiefly from Matabeleland, during the year.

The result of better housing, feeding and management of pigs is reflected in the improved quality and uniformity of animals supplied to bacon factories or for export. Given reasonable care and attention, pig farming should prove a profitable under-

taking at the prices paid by bacon factories during the year, but like other classes of stock which are allowed to forage for a living, neglected pigs are more likely to be a liability than an asset. Good clean wholesome food is just as necessary for pigs as for any other animal, and the old idea that anything was good enough for a pig is no longer generally accepted. There is still room for improvement in the methods adopted by some pig breeders, but experience will show that good housing, feeding and attention will more than repay the slight additional cost and work entailed.

Poultry Branch.—In spite of the efforts made by the Experts, the poultry industry does not show the progress one might expect. For some unknown reason, if any side line in farming is to be neglected, poultry keeping is usually the first to suffer. This may be due to the mistaken idea that poultry can look after themselves. No doubt this may be more or less correct, but lack of attention means fewer eggs and a decline in profits. It is just as essential to look after poultry properly as any other class of live stock on a farm, but if crops are likely to bring in a profit, the inclination seems to be to neglect the poultry side. This is to be regretted, as dairy cows, pigs and poultry provide the monthly cheque, which in many cases successfully carries the farmer over lean times.

It will be noted from the report of the Poultry Expert that during a period of ten months eggs to the value of over £10,000 were imported into the Colony. About two-thirds of the eggs imported were again exported, chiefly to Northern Rhodesia and the Congo markets. There seems to be very little necessity for the importation of nearly one and a half million eggs, as this number might without much difficulty be produced in Southern Rhodesia in addition to the present production.

The tendency to drop the side lines in farming which, in numerous instances, provide the monthly cheque, and to concentrate on one particular crop is treating farming more or less as a gamble. If the crop is successful, and can be profitably disposed of, all is well; but, on the other hand, should the crop fail, or if there is no great demand for it, the result is disastrous. It cannot be too strongly emphasised that it is bad farming to put all one's eggs in one basket, and it should be remembered that dairy cows, pigs and poultry can provide the cash essential for monthly expenses, and these invaluable standbys should not be dropped just because one hears of people having done well with one crop.

It has been stated that the risk in farming should always be spread as far as possible, and the possibility of a total loss of income during any year is greatly reduced by those who carry out mixed farming in preference to the one-crop method. Although poultry farming may not prove a fortune-making business, there is no reason why a fair profit should not be made if it is run on sound lines, and more attention might profitably be devoted to this industry. The amounts now being paid for imported eggs might just as well be paid to egg producers in this Colony as to producers in other countries, and it is hoped in the near future that poultry keepers in the Colony will be able to supply all the eggs required for export and that imports of this commodity will decrease.

Cotton Specialist's Branch.—The cotton-growing industry at the present time is more or less in the experimental stage, and very small acreages are being planted to this crop. The report of the Cotton Specialist, however, shows that satisfactory progress is being made in establishing jassid-resisting strains, and within a few years it is anticipated that a general distribution of seed suitable for the conditions of the country will be possible. Until this can be done little cotton will be grown except for crop rotation purposes. If satisfactory jassid-resisting and early-maturing varieties can be established, the growing of cotton would no doubt receive a good deal of attention, as it would then be an economic and paying proposition.

At different times during the year Sir James Currie, a Director of the Empire Cotton Growing Corporation, and Sir William Himbury, Managing Director of the British Cotton Growing Association, visited the Colony and were able to see a good deal of the country, with which they were favourably impressed.

It is unfortunate that the three ginneries in which the Government, the Empire Cotton Growing Corporation and the British Cotton Growing Association are interested have been so little in commission, but it is hoped when suitable seed can be distributed that they will be run profitably.

Entomological Branch. — As farming operations extend it is to be expected that more crop and other pests will have to be dealt with by the Entomologists. A good deal of time and attention have been devoted to tsetse fly investigations, and the position regarding this menace in Lomagundi district has shown an improvement. The erection of fences and the destruction of game within the boundaries of the fences have certainly proved beneficial, and it is hoped to extend the fencing beyond the present line with a view to the further testing of this means of combating the tsetse fly menace.

If by fencing and destroying game a barrier zone can be created, the cost of considerably extending this method of driving back tsetse fly would be fully justified. In the Gatooma area there has hardly been time to allow of a statement being made as to the results obtained from the work being carried on there, but if fencing and game destruction are proving satisfactory in Lomagundi district, similar results may also be looked for in Gatooma area. In the latter area, however, there is more likelihood of fly being carried by motor vehicles, but the question as

to whether the carrying of fly in this manner will result in any real danger to stock owners in areas free from tsetse fly is somewhat indefinite. The thought, however, of having "fly" carried by any means to the vicinity of valuable cattle is very disturbing, and causes owners of animals a good deal of anxiety. The report of the Chief Entomologist deals fully with the matter of tsetse fly and trypanosomiasis, and the steps being taken to deal with these pests.

The selection of game sanctuaries in the Colony is a matter which has to be very carefully investigated on account of tsetse fly. Likely areas for game reserves, however, are under consideration, and it is anticipated that at a very early date a large area in Wankie district will be declared a game sanctuary. Other areas will be inspected, and the Chief Entomologist will probably be able to make definite recommendations in connection with the question of protecting game in further selected areas during the coming year.

Irrigation Branch.—During the year the branches of the Irrigation and Agricultural Engineer and the Hydrographic Engineer were placed under one control, and are now in charge of the Irrigation Engineer. The activities of this branch, which are very varied, and embrace matters not only affecting irrigation, include agricultural engineering generally and also all hydrographic and meteorological work.

The question of soil erosion is now having more attention from farmers than in the past, and frequent requests for advice are received in connection with this important subject, which, however, does not yet receive the consideration it deserves from land owners. The matter is one which should be dealt with in its early stages and before irreparable damage is done, and not left over as a question of no great urgency for another year. Most farms suffer to a greater or lesser degree from this land destroying agency, and more efforts should be made to retain the valuable soil which, without some form of protection, is carried away yearly during heavy rains. An extract from a letter received from a well-known maize grower in the Mazoe district is quoted in the Irrigation Engineer's report, and from this it will be seen how essential it is to protect land from the ravages of soil erosion.

Water boring has been carried out continuously during the year, and, although further water-boring drills have been purchased, the demand for boreholes during the year has been in excess of the plants available. There are now eight water-boring machines in constant use on farms, and it may be necessary to increase this number. Particulars of the costs of boring and the revenue and expenditure of the different boring plants will be found in the report of the Irrigation Engineer.

Chemistry Branch.—It is gratifying to note from the report of the Chief Chemist that the samples of soil received for analysis is over one hundred per cent. in excess of the number received during the previous year. It has recently been stated that the soil and its productivity are the foundations of all agricultural systems, and Agricultural Chemists can furnish most useful information to farmers as to the suitability of their soils for growing any particular crop, and are able to give valuable advice as to the best methods for manuring or fertilising land to obtain the highest production. The successful farmer no longer employs haphazard methods of farming, and realises that to obtain the best results scientific methods of agriculture must be carried out. It is necessary, however, for the farmer and the agricultural scientist to work together, and agricultural chemistry plays a big part in the game of successful and scientific farming.

As in the case of animals, land must not be starved, and to get the best out of it deficiencies in the soil must be made good and the land kept in a state of fertility, which will enable it to produce crops on a payable scale. Too much use cannot, therefore, be made of the Chemistry Branch of the Department, as on most farms much can still be done to improve the productivity of the soil, which means more profitable crop returns and more nourishing pasture for cattle. It is hoped that the Empire Marketing Board will provide a grant on the £ for £ principle with the Government of Southern Rhodesia for the purpose of research work in connection with the investigation of the mineral deficiencies in the natural pastures in the Colony.

The remarks of the Chief Chemist in his report on this important subject will be of much interest, more particularly to stock owners, and if the proposed investigations can solve some of the problems of malnutrition in animals, valuable work will have been accomplished.

There is no doubt that the benefits of agricultural chemistry in relation to farming are of the greatest value, and it is evident that this is becoming more and more realised.

Tobacco Branch.—The report of the Tobacco and Cotton Expert gives very full details of the activities of this branch. The experiment of providing district tobacco advisers has on the whole proved successful, but the necessity for retaining the services of all the Tobacco Advisers brought over from America is not now so essential, as in every district there are a number of local growers with a good working knowledge of growing and handling tobacco who are always willing to advise and assist new growers.

With the more suitable buildings now available for curing, and the establishment of numerous grading warehouses throughout the country, the quality of the Rhodesian product should improve considerably, but until a market is established which can absorb the total production, growers would be well advised in the meantime to look to quality

rather than quantity, and to spread the risk of farming as widely as possible by growing crops other than tobacco.

Mycology Branch.—Much useful research work has been carried out by this branch, and the reasons for failure in certain citrus crops have been closely investigated with satisfactory results. Tobacco diseases have taken up a good deal of the Mycologist's time, and his remarks on this subject will be of much interest to growers.

With the increasing acreage planted to crops, more plant diseases must be anticipated, but, as stated by the Mycologist, provided that control measures advocated are thoroughly carried out there is no reason to anticipate that these diseases will become a serious menace.

Forestry Branch.—It is satisfactory to find the increased interest now being taken in afforestation. The depletion of indigenous timber has been going on steadily for the last thirty years, more especially in the vicinity of towns and mines, and little has been done to replace the large forest areas cut out. Although in most cases the trees cut down send out new shoots, these, without any attention, develop into coppice growth, and areas at one time heavily timbered with fine trees now show what can only be termed scrub brush. Most varieties of trees on areas where the timber has been cut respond very quickly if they are given a reasonable chance to make new growth, and there is no doubt that a little attention in this respect is amply repaid by the results obtained.

The demand for forestry advice during the year under review has far exceeded that for any previous year, and although the forestry staff has been doubled, it is still hardly possible to meet all requests made for assistance and advice in connection with tree planting.

From the report of the Forest Officer it will be seen that the areas planted to trees at Mtao during the year amounted to 276 acres, and this must be looked upon as a valuable and increasing asset. The arrangement at Mtao for providing work for Europeans who are out of employment has proved satisfactory. At one time men out of work were given employment on road making, but this was both costly and unsatisfactory. At Mtao the men are able to live comfortably, and the nature of the work appeals to them far more than working on public roads. Hard work, regular hours and good food have a wonderfully good and bracing effect on these men, many of whom arrive at Mtao in a very run-down state of health.

The protection of indigenous forests against fire is a matter of the utmost importance, and large areas of valuable timber are now showing the benefits of the activities of the forestry officials in this direction.

The demand for transplants and seeds is increasing steadily, but farmers and others might do a good deal more for themselves in growing transplants, which is not a costly or difficult business.

Much leeway in afforestation has to be made up in this country, and some enthusiasts are now endeavouring to form an Arboricultural Society and to institute tree growing competitions throughout the Colony. A society of this nature can do much good, and the promoters deserve much credit for their initiative in starting the scheme.

NATIVE LABOUR.

In many instances the shortage of native labour has been acute, whilst in other cases the labour offering has been in excess of requirements. A good deal of the success or otherwise of obtaining native labour depends on the methods adopted by employers in handling their employees. It frequently happens that natives prefer to work for one employer at a lower wage than could be obtained from other employers. In a good many cases piece work has been tried on farms, and although it is stated to be fairly satisfactory, the inclination is for farm natives to scamp their work under this system, and this method of working may be more suitable for natives employed on mines than for those employed on farms. The general efficiency of native labourers improves very slowly, but farmers who can personally demonstrate how work should be done are likely to get more out of their native employees than the employer who gives instructions which probably in many cases are not understood by the native working for him.

There is little doubt that for successful and economic farming more efficiency in native labour is essential, and to obtain this increased efficiency will be a difficult matter for employers who are inefficient themselves. It is likely that at no distant date natives employed on farms, except those carrying out essential work, will demand to be released from work on Saturday afternoons and Sundays, and they will no doubt also demand better housing than is provided on many farms at the present time, and may insist on being given better rations. They see the better conditions under which mine boys are employed, and similar conditions will eventually have to be granted to farm labourers. Farmers should, therefore, prepare themselves for this by endeavouring to get better and more intelligent work from their native employees. As the settlement of the country expands native labour difficulties must increase, and the most economical and efficient methods of farm management will have to be adopted. The system of planting large acreages is in many cases a form of agricultural speculation, unless the grower has an assured labour supply and is in a financial position to carry the crop through. It is very essential that the minimum number of not only native servants, but also of working animals should be employed. Good farming must be done, and endeavours made

to increase the productivity of the land. As competition gets keener and farmers have to compete in the world's markets, the necessity for farming on efficient and up-to-date lines is very evident, and it would be well to remember that inefficient labour is usually a costly business. Labour-saving devices will assist matters, but these in many cases are costly, and are not within the means of many.

AFRICAN COAST FEVER.

The position regarding African Coast Fever has improved appreciably during the last six months. This to a great extent is due to the system of intensive supervision introduced about a year ago, and also to the close co-operation of cattle owners, without which it would have been almost impossible to have made satisfactory headway in combating the disease. It is hoped, now it has been shown that the disease can be satisfactorily dealt with, that the existing close co-operation between cattle owners and the Veterinary Department will continue, as it is only by this means that the disease can eventually be stamped out. It is not unnatural to find a few people who are dissatisfied, and who consider the Government and the Veterinary Department are deliberately creating unnecessary hardships and restrictions, but most cattle owners realise that the Government is genuinely anxious and determined to rid the country of African Coast Fever, and the whole staff of the Veterinary Department is loyally carrying out the work of ridding the country of a disease which for many years has been a source of the greatest anxiety to all owners of cattle in Southern Rhodesia. There can be no weakening or slackening off in dealing with this disease, and all cattle owners must give the Government and the Veterinary staff their whole-hearted support, otherwise good work already done may have been done in vain. As was stated in my last annual report, stringent regulations, heavy penalties, or Government supervision and inspection can never rid the Colony of African Coast Fever, and it is only from the combined efforts of the Government and cattle owners that success can be expected. The advice preached by the Veterinary Department to cattle owners is to dip cattle regularly in a solution up to the prescribed strength, and, in addition to dipping, to carry out, if necessary, hand dressing. The extermination of the tick should be aimed at, and this can only be done by the combined efforts of those who desire to see the menace of African Coast Fever removed from the Colony.

LOANS FOR FARM DEVELOPMENT AND FOR PURCHASE OF STOCK.

The amount of £25,000 originally provided for farm development loans is now in its third course of distribution. This does not necessarily mean that the total of the amounts issued on loans has been repaid, but loans issued and re-issued for assisting farm development reached a total of £54,818 0s. 6d. at the end of December last.

Applications for loans for the purchase of stock are now beginning to come in more freely, and it is anticipated that during the coming year many more requests will be made under this heading.

Foot and mouth disease in England has restricted the importation of pure-bred animals from overseas, and although the quarantine arrangements in London were expected to be ready in November last, it is not anticipated that they will be completed before the end of March, and then accommodation will be provided for 50 animals only for the whole of the Union of South Africa and Rhodesia. This arrangement has caused much disappointment, as applications have been made by Rhodesian stock owners for the importation of over 200 head of pure-bred animals. It was also anticipated that quarantine stations would be established at Glasgow and Liverpool to enable animals to be sent from these places, but apparently no steps have yet been taken to provide these stations. As soon as suitable arrangements can be made to import animals from overseas it is anticipated that many applications for loans will be received from cattle owners who desire to improve their herds.

LEGISLATION.

The following Bills affecting the Department of Agriculture and Lands were passed during the year:—

Fertilisers, Farm Foods, Seeds and Pest Remedies Amendment Bill, 1927.—This was a very short Bill making provision for the inclusion of "Wheat Screenings" in the list of exceptions in section 3, sub-section (2) of Ordinance No. 9 of 1920.

Land Bank Amendment Bill, 1927.—This Bill alters the definition of "Minister" from "Minister of Agriculture and Lands" to "Treasurer."

Under the "Land Bank Act, 1924," advances could only be made to the extent of 60 per cent. of the land and improvements to be effected, but the amending Bill permits in addition advances for dipping tanks, boreholes and fencing, limited to £150, £150 and £200 respectively, provided that such advances do not exceed in all 75 per cent. of the value of the land and of improvements effected or to be effected, including any amount advanced for the special purposes mentioned under the new Bill.

Provision is also made under which farmers who have taken up Crown land may be granted loans in excess of the limit of 50 per cent. fixed by section 27 (3) of the Act of 1924, and additional loans may now be granted for the purposes of dipping tanks, boreholes and fencing to the amounts stated

above; provided, however, that the total amount of all loans granted does not exceed 60 per cent. of the amount of the purchase price already paid, and of improvements already made or to be made under the provisions of the new Bill.

Cattle Cleansing Bill, 1927.—This Bill repealed the "Cattle Cleansing Ordinance, 1918," and the amending Ordinance of 1923.

The chief alterations to the 1918 and 1923 Ordinances consist of amended definitions of "tick infestation" and "owner." Provision is also made whereby owners of land on which native cattle owners reside must take steps to provide for the cleansing of such cattle and for the keeping of a register of all native cattle owners residing on their land, showing the number of cattle owned by such natives, and the number of cattle dipped on each dipping day by each native owner. A few minor amendments were made, but these call for no special comment.

STAFF CHANGES DURING 1927.

New Appointments.—

J. A. T. Walters, Agriculturist (re-transferred from High Commissioner's Office).

T. W. Wilkinson, Assistant Forest Officer.

G. Drysdale, Forester.

J. H. Boyd Patterson, Forester.

A. W. Taylor, Agricultural Chemist.

D. E. McLoughlin, Assistant Agriculturist (re-transferred from Lands Department).

Retirements.—

H. W. Hilliard, Assistant Agriculturist.

A. S. Thornewill, Forest Officer.

Transfers.—

E. D. Alvord, Native Agricultural Instructor (to Native Department).

C. Mainwaring, Agriculturist (seconded to Matopo Farm as Manager).

A. W. Facer, Chemist (transferred to Medical Director's Department).

I have much pleasure in placing on record the good work done by all members of the Department during the year.

D. McDONALD,
Secretary, Department of Agriculture.

LIST OF ANNEXURES.

"A"—Statistical Return, 1914 to 1926.

Reports of—

"B"—Chief Agriculturist.

"C"—Stock Adviser.

"D"—Dairy Expert.

"E"—Poultry Expert.

"F"—Cotton Specialist, Empire Cotton Growing Corporation.

"G"—Chief Entomologist.

"H"—Irrigation Engineer.

"I"—Chief Chemist.

"J"—Tobacco and Cotton Expert.

"K"—Mycologist.

"L"—Forest Officer.

"M"—Botanist.

"N"—Editor, Rhodesia Agricultural Journal.

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926
Cattle—													
Number of European ...	341,878	394,856	468,504	532,311	600,447	678,508	772,891	905,040	936,251	993,608	1,003,629	1,006,086	991,216
,, Native ...	406,180	445,795	491,522	551,632	610,100	652,776	744,402	845,498	864,894	927,343	1,005,277	1,095,841	1,197,466
Total	748,058	840,651	960,026	1,083,943	1,210,547	1,331,284	1,517,293	1,750,538	1,801,145	1,920,951	2,008,906	2,101,927	2,188,682
Total acreage under cultivation as summer crops	183,407	202,946	249,038	229,953	205,439	211,094	237,268	228,000	266,607	286,837	334,604	355,481	346,776
Maize (European)—													
Acreage	167,012	174,647	203,150	192,148	173,313	173,467	186,246	181,729	220,937	231,638	232,947	239,662	267,354
Yield (bags)	914,926	680,285	938,130	591,722	889,969	1,120,548	1,220,768	662,636	1,505,580	1,080,084	1,041,904	1,393,654	1,659,597
Tobacco—													
Acreage	1,370	1,310	1,995	3,247	4,197	7,504	9,531	10,174	9,054	8,003	8,441	13,915	30,162
Yield (lbs.)	426,423	637,261	910,684	620,171	1,467,612	2,947,627	3,746,982	3,182,359	2,810,781	3,878,460	2,405,940	5,659,809*	19,264,532
Butter (lbs.)—													
Farm	151,916	294,568	221,965	204,886	209,439	294,784	244,761	255,104	292,964	338,343	425,018	393,539	438,443
Creameries	...	...	...	...	...	...	...	...	282,850	554,206	871,714	1,002,850	1,168,847
Total	...	...	..	...	...	...	...	...	575,814	892,549	1,296,732	1,396,389	1,607,290
Exports—													
Maize and mealie meal (bags)	205,441	363,349	76,390	252,219	216,348	338,144	513,640	365,139	72,120	790,810	407,585	419,407	486,350
Tobacco (lbs.) ...	2,237,580	1,534,883	1,311,411	705,597	896,701	829,608	1,737,473	2,383,284	2,248,375	3,973,832	5,018,774	2,435,507*	4,287,833
Cattle	12	7	12,815	13,221	23,672	27,735	37,285	12,408	23,938	34,841	50,770	60,543	74,821
Butter (lbs.) ...	55,041	48,648	75,319	282,336	106,227	125,225	204,678	421,815	277,700	342,759	589,861	560,746	775,023

* In connection with the above figures, it should be noted that while cattle, butter and exports are for the calendar year ended 31st December of the year shown, the acreage under summer crops, as also the figures for maize and tobacco, are for the season in which planting was commenced in the year under which the figures are shown, but the crop was not reaped until the following year. Exports, therefore, should be taken as relating to the crop reaped during the year previous to that under which the exports appear.

Annexure "B."

Report of the Chief Agriculturist for the Year 1927.

Crops.—The rainfall for the season was appreciably below normal, but in spite of this crop yields, except over considerable portions of Matabeleland, were highly satisfactory. The area planted to maize exceeded that planted the previous year, and the average yield—approximately 6.21 bags an acre—was the fourth highest recorded for the Colony. The total production of maize was the largest Southern Rhodesia has yet attained.

Ground nuts are surely, if slowly, establishing themselves as a major crop. The year 1925-26 saw an increase of 1,000 acres in the area devoted to this valuable oil seed, while in 1926-27 a further 1,400 acres were added, bringing the total under this crop in 1926-27 to 7,530 acres, which returned an average of slightly over 8 bags (75 lbs.) of unshelled nuts an acre. Compared with maize, this yield is still unduly low: a country which over its whole area can produce an average of 6 bags an acre of maize should grow not less than 10/11 bags an acre of ground nuts, a crop for which local climatic and soil conditions are equally favourable. It is evident that even yet the ground nut is not receiving as good treatment as its profit-returning capabilities warrant.

Legumes grown for green manuring showed an increase of only 100 acres, the figures being 7,039 acres in 1925-26 and 7,132 acres in 1926-27. Of the total area green manured, Mashonaland was responsible for 6,706 acres and Matabeleland for only 426 acres. Many of the soils of Matabeleland stand in great need of more organic matter to enable crops better to tide over periods of drought, and it is to be regretted that farmers in that part of the Colony are not more quick to adopt this inexpensive method of improving their arable lands.

Statistics in respect of the amount of veld hay annually cut and made bring into strong relief the improvidence of many farmers. In 1925-26 the statistical returns showed that 28,724 tons of veld hay were made and in 1926-27 24,433 tons. On a conservative estimate there are fully 3,000 farmers and section managers in the Colony, and assuming that those who make hay make not less than 20 tons a year—many make much more—there would remain nearly two-thirds of the total number who apparently make none at all. It is not surprising that mortality amongst stock due to poverty is high, and the need for putting to better use the enormous surplus supplies of good grass which the country grows each rainy season is obvious.

Horticulture. — The Horticulturist has principally devoted his time to the development of the citrus industry and to the promotion of a larger measure of interest in deciduous fruit orchards—the latter combined with an extension of the sales of locally-grown fruits.

Referring to citrus export, this officer states that there has been a considerable improvement in both the quality and quantity of the fruit shipped overseas. Southern Rhodesia's export amounted to 154,168 cases, and represented about one-seventh of the total shipments from South Africa. Good progress has been made in opening up new markets for citrus fruits. Consignments were sent to Singapore, Bombay, Egypt, Greece and France, resulting in satisfactory returns to the shippers, and it is anticipated that increased export will take place to these markets in future.

All available cold chamber space in ships calling at Beira was utilised for citrus export, and it is gratifying to record that the condition of the fruit passing through this port was favourably commented upon after arrival at its destination. The results of export through Capetown were not so satisfactory, and consignors received several complaints concerning the poor quality of the fruit thus shipped. On account of these complaints the Horticulturist visited Capetown in May and was present when several thousand cases of Rhodesian fruit were inspected and shipped. He is of opinion that the injury to fruit going through the southern port appears to be due either to the long railway journey to the coast or to it being subjected to very low temperatures after arrival there. In all, 125,976 cases of citrus were exported *via* Capetown and 28,192 cases through Beira.

Turning to deciduous fruits, the Horticulturist has been informed by local nurserymen that their sales of young trees have been approximately double that of any previous year. After visiting the eastern border of the Colony from North Inyanga to South Melsetter, he is satisfied that much of that area is capable of producing deciduous fruits equal to those from the best fruit districts of the Union of South Africa.

Many farm orchards are being given more careful and scientific attention than they have received in the past, and there are indications that a number of farmers are exploiting this source of revenue more seriously. The Horticulturist considers that if growers will only adopt more modern methods of orchard management, and of harvesting, grading and packing, there should be little need for this Colony to draw upon the south for supplies of fruit.

The need for the introduction of new and improved varieties is not being overlooked. Almonds are being raised on the Salisbury Experiment Station for planting on the Tobacco Experiment Station and at the Rhodes Inyanga Estate. Pecan nuts for planting

have been received from America, together with some of the best selections of avocado pear and feijoa. The arrival of other similar introductions is awaited.

Gwebi Farm.—The manager and his staff are to be congratulated on a highly successful year, in spite of a rainfall which only amounted to 26.38 inches and a season in which several long periods of drought occurred. Of a total of 588 acres under crops, maize occupied 332 acres and yielded 11 bags to the acre. Sunflower returned 14½ bags an acre, ground nuts 20 bags, potatoes 109 bags and oats 3⅓ bags an acre.

Cattle and pigs have continued to do extremely well, but in spite of the utmost care and attention the mortality amongst sheep was unduly high.

The Friesland herd was increased by the purchase of seven pedigree cows and heifers which were imported from the Union, bringing the total number of pedigree animals on the 31st December to 33 head. Grade Frieslands on the same date numbered 38. Many of these cows and heifers have put up very satisfactory milk records. Four young pedigree bulls bred on the farm were sold at the last Salisbury Agricultural Show sale and realised good prices. All calves are hand-reared and bucket-fed from birth; there was no mortality or sickness amongst the calves, which numbered 21. The grade Shorthorn herd, with the exception of some young bullocks, was disposed of during the year.

Fifty-five bullocks were fattened, some of which were sold locally and some in Johannesburg. An average profit of £2 per head was made.

The pigs consist of a herd of pedigree Middle Whites, with some Large Black sows for crossing purposes. Ten pure breds and 58 baconers were sold during the year.

The sheep flock, consisting of merinos, blackhead Persians and merino-wool Persians, numbered 209 at the beginning of the year and 177 at the end of the year. Seventy-eight lambs were dropped, but deaths accounted for 58 head of sheep of all ages.

During the month of January, 2,850 yards of eucalyptus wind-breaks were planted around the paddocks, and, in addition, a six-acre plantation of gums was set out. In both cases a good stand of trees has been obtained. Sufficient seedling gums have been raised to put down a further plantation of 13 acres in 1928.

Seed of the various crops grown on the farm was in considerable demand, and more could have been sold than was available. Revenue from this source amounted to £485.

Careful records have been kept of the actual cost of all farming operations, including the growing of crops and raising of live stock. In the figures given below no charge has been made for European labour or supervision, or for interest on capital invested in land, stock or implements, or for depreciation of live stock or implements, or, in the case of crops for the value of the seed sown. Omitting these charges, but including all others, the cost of preparing 588 acres of arable land for crops was found to average 5s. 10d. an acre.

The 11-bag-an-acre maize crop cost 4s. 1d. a bag to raise, including cost of bag and sewing; while the 109-bag-an-acre potato crop cost 3s. 9d. a bag, or 4s. 8d. a bag if the return of only table and seed potatoes is taken into account. On the same basis sunflower seed cost 4s. a bag to produce, oats 12s. 1d. a bag, sweet potatoes (making no allowance for the value of the "tops") 12s. 2d. a ton of tubers, ground nuts on a 20-bag-an-acre crop 4s. 6d. a bag, bean hay 22s. 5d. a ton, maize and beans for silage 5s. 9d. a ton, and green manuring with a legume 10s. 10d. an acre.

Development work has continued; a range of six pig sties and feed room constructed of brick, under thatched roof, was erected; also post and rail fattening pens to accommodate 60 bullocks, together with an engine shed, in which a power grinding plant was installed.

The total cash revenue for the year was £3,804 6s., and, if allowance is made for certain other amounts still due to the farm on the 31st December, the total cash receipts may be put at approximately £4,000.

Matopo Farm.—Progress at this centre was less satisfactory and all crops were extremely poor, except irrigated potatoes planted in August, which yielded a profitable return. Thirty acres of tobacco failed to prove remunerative on account of drought and a severe infestation of root nematode, the presence of which on land which had lain fallow for many years could not be anticipated. The equipment of the tobacco section was completed during the year by the erection of a grading shed.

The small herd of grade Friesland cows, the crossbred sheep, and, in particular, the pigs, have continued to do well, and have demonstrated the suitability of the farm for better bred animals of these kinds. The grade Shorthorn herd has been disposed of.

On the 1st October Mr. Mainwaring, Agriculturist, was seconded to the farm in the capacity of manager, and it is confidently anticipated that under his management the task of developing the property and increasing its productivity will rapidly be accomplished.

Sales of stock and produce during the year realised approximately £600.

Salisbury Experiment Station.—The investigations carried on at this station are too numerous and of too intricate a character to be referred to at any length in this report. The more important general results are published yearly in an annual report of the station, and the outcome of any particular enquiry is made known by means of a report specially devoted to that subject.

During the year increased attention was given to the selection of wheat varieties exhibiting rust-resistant characters and to similar work towards improving the quality of the two most popular varieties of summer oat, namely, Kherson and Kinvarra. The selection of improved strains of sunflower and buckwheat was continued. The number of systems of crop rotation under investigation has been enlarged, and while the older established rotations continue to support the results previously obtained, the more recently initiated systems also promise to afford much valuable information.

Farmers are evincing increased interest in kudzu vine and edible canna. The value of the former, when once established, as a perennial forage and grazing crop has been amply demonstrated over a number of years, and the latter appears likely to become a popular pig and cattle feed. Judging by the demand for cuttings many more farmers are now also putting down considerable acreages to sweet potatoes.

The work on the station has increased owing to the more frequent repetition of the plots, a system found necessary in order to reduce the time within which reliable deductions can be drawn.

In co-operation with the Chief Chemist, a modest commencement has been made in testing the effect of artificial fertilisers on pasture land.

Visitors to the station during the year numbered 200.

Eighteen introductions of new crops or new varieties were made, and free issues of seed and plants were as follows:—

To farmers in Rhodesia ...	289
To other Government farms in Rhodesia	302
To foreign institutions and experiment stations ...	151

Much time and labour is expended in preparing produce exhibits for local agricultural shows, for use at the High Commissioner's office in Great Britain, and for other objects pertaining to publicity.

Mr. H. C. Arnold has continued to manage the station with marked ability and initiative.

Tobacco Experiment Station.—A highly successful year can be recorded for this station, for which much credit is due to the manager. The total rainfall amounted to only 20.48 inches, but in spite of this the tobacco crop grew well, yielded heavily and was free from bacterial disease. The latter fact is significant, since, with the exception of a few introduced varieties, all the tobacco was raised from seed selected from the most disease-resistant plants of the previous year's crop which was severely attacked by "spot." Some criticism was directed against the Department for selling a small amount of "treated" seed from this infected crop, but the resulting clean crop on the station in 1927 confirms the view then held, namely, that the fears expressed by the persons referred to were unjustified. The utmost care was naturally taken to disinfect seed-bed covering and all material and buildings on the station which might have become contaminated by the previous diseased crop.

The station manager reports that the 1927 crop consisted of 40 acres, divided into 107 experimental and demonstration plots, comprising trials of fertilisers, green manures and tobacco varieties, together with various systems of rotation, and spacing tests, and the apprentices' own plots. The highest yield recorded was one of 1,500½ lbs. of flue-cured leaf per acre.

The crop was cured, graded and packed by the station staff and the apprentices, the total weight of tobacco secured being over 30,000 lbs., of which 22,215 lbs. was "brights and mediums."

Six apprentices completed their period of training and obtained salaried positions on farms, where they are understood to be giving satisfaction to their employers. The vacancies thus created were filled by new apprentices drawn from the following districts: Rusape, Que Que, Bulawayo, Nyamandhlovu, Enkeldoorn and Gwanda. In addition to instruction in all phases of tobacco production, the apprentices have received a number of lectures on other agricultural subjects from the various officers of the Department.

The small grade-Friesland herd has continued to do well, and has fulfilled its dual object of supplying the station with milk and affording the apprentices an opportunity of learning approved methods of feeding, milking and managing dairy cattle.

The system of giving to each apprentice a plot on which he unaided does all the work in connection with raising the crop of tobacco has proved a great success in promoting keenness and imparting knowledge of the actual labour entailed in each operation.

Visitors to the station during the growing season of the crop averaged five a day.

Development work has proceeded; 20 acres of new land have been cleared and ploughed, the vlei has been prepared for winter crops, 6,000 eucalypts have been planted, the fire-curing barn has been converted into two flue barns, and the water supply has been augmented by a power pump and two additional tanks.

Bulawayo and Gwelo Municipal Demonstration Stations.—Work at these centres was conducted on similar lines as in the past, and the results obtained over the periods the stations have been in existence are being summarised and tabulated by the Assistant Agriculturist with a view to early publication in the *Agricultural Journal*. To those willing to learn, the Bulawayo plots and the light sandy soil area of the Gwelo station have many valuable lessons to impart, and it is to be regretted that the farming public served

by these small demonstration farms does not make greater efforts to profit by their proximity. The aggregate crop returns at Bulawayo over a period of six years, and those at Gwelo over four years, in spite of intervening seasons of extreme drought, should provide farmers in those parts of the country with cause for serious reflection as to whether the methods successfully adopted on these stations cannot more generally be followed. The continuation of demonstrational work at these two centres, through the mutual assistance of the municipalities concerned and the Government, must obviously depend upon the value which the institutions appear to be to the farming community.

Coffee.—Considerable interest has been aroused in the possibilities of growing this crop, and, in addition to those who are experimenting with it in the Melsetter district, many farmers possessed of irrigated land in other areas are conducting trials on a small scale.

Tea.—The preliminary experiments with tea carried out by Messrs. Ward and Phillips, of South Melsetter, and referred to in my report for last year, have shown such excellent promise that these gentlemen have recently imported a large amount of seed and anticipate being able to plant out upwards of 100 acres of tea within the next 12 months.

Sugar.—Messrs. P. D. and H. Crewe's untiring efforts to demonstrate the commercial properties of sugar cane on Nantwich Ranch, Wankie district, have, it is understood, met with such support from prominent sugar-growing interests in Natal that a company is being formed to plant the cane on an extensive commercial scale on other farms in the vicinity of Nantwich. This important development, together with the extended area of tea to be planted in South Melsetter, will be watched with the greatest interest by all who make the agricultural progress of the Colony their concern.

Maize Export.—The grading of maize for export was commenced on the 19th July, and from that date four graders were kept fully employed until the beginning of November, when the number was reduced to three. Of these four officers, two had more than one season's previous experience of the work. Each grader was provided with a Brown-Duvel moisture tester, and a larger number of moisture tests than ever previously were carried out. In spite of the greatest precautions a certain amount of maize containing more than 12.5 per cent. of moisture escaped the vigilance of the inspectors and was temporarily rejected for export at Beira. His Excellency the Governor of the Mozambique Territory, however, kindly permitted this maize to be shipped as an experiment, with a view to ascertaining the condition in which maize with an appreciably higher moisture content than 12½ per cent. would carry to European markets. Unfortunately the variable moisture content of the consignment, the mouldy condition of a good deal of it, and the fact that it was shipped in "shelter" decks preclude the experiment from being of much value.

For various reasons, some explainable and others difficult to define, this season's maize was considerably more moist than usual, and it is significant that one large stack under cover in Salisbury when broken down for grading during January still contained in its centre an appreciable number of bags of maize too moist to pass the test. Throughout the season, and before the rains commenced, it was found that in the stacks along the railway line the inner sacks, and particularly the centres of these sacks, contained maize of a much higher moisture content than those on the outside of the stacks. In many cases the moisture content of the grain in sacks on the outside of the stack was 12½ per cent. or less, while on the inner sacks it was 14 per cent. and even higher.

The senior Grain Inspector states that many farmers seem under the erroneous impression that unhusked maize harvested while still moist will dry out appreciably in the "dumps" prior to shelling. This is not the case, however, and growers who reap their crop before it is dead ripe and dry should adopt one or more of the following precautions:—

(a) Husk the ears and give the grain fair opportunity of drying out before riding the cobs to the dump.

(b) Leave unhusked ears exposed to air and sunlight as long as feasible, and refrain from building such ears into the huge dumps often seen through which circulation of air is almost entirely prevented.

(c) Carefully examine the grain in the bags after threshing, and if the germ is still unduly moist (ascertainable by the thumbnail test) allow the sacks to stand upright around the threshing floor for as long as possible to permit of drying out of the grain.

In all, 603,616 bags of maize were graded for export, 8,860 of these being examined at Bulawayo. Maize passed as 2nd grade represented 96.3 per cent. of the total, and only 2.3 per cent. was rejected. Of maize meal, 9,904 bags were graded in Salisbury and 9,970 bags in Bulawayo. Maize railed to Beira for export overseas amounted to 465,537 bags.

Labour-Saving Appliances.—During the year enquiries were directed by the Secretary's office to numerous other countries with a view to obtaining the latest information regarding labour-saving machinery employed in other parts of the world, and which, judged by reports, might be suitable for introduction into Rhodesia. The replies and catalogues received were analysed by the writer, but it is to be regretted that in the majority of cases the only safe means of deciding upon suitability or otherwise is by

actual trial and demonstration in this Colony. The high initial cost of most of the machinery acts as a deterrent to introduction by local agents or private enterprise, but it is satisfactory to record that arrangements have been concluded for demonstrations here with farm tractors equipped to use suction gas as the running fuel instead of petrol or paraffin, and with a popular make of American maize picker. These trials will be carried out under supervision of officers of the Department of Agriculture, and endeavours are being made to arrange with other firms for similar demonstrations with other types of labour-saving machinery.

Special Exhibits.—Exhibits representative of the crops of Rhodesia, much of the material for which was grown on the Agricultural Experiment Station, Salisbury, were prepared by the Manager of that station for the High Commissioner's Office, London, for the Nairobi Show, at the invitation of the authorities in Kenya Colony, and for the Italian Exhibition Ship, *S.S. Sistiana*, which visited African ports.

Farmers' Days.—A successful farmers' day was held at the Gwebi Farm on the 14th May—a rather later date than is generally advisable, since the relative effects of different treatments on the various crops cannot then so well be seen as about the end of March or first week in April.

Publications.—The following publications were issued by members of the branch through the medium of the *Rhodesia Agricultural Journal*:—

1. Annual Report of Experiments, Salisbury Experiment Station, 1925-26.
2. Storage of Seed Potatoes, by H. C. Arnold, Manager, Agricultural Experiment Station.
3. Notes on Flue Curing of Tobacco.
4. Notes on Tobacco Growing Competition, by C. A. Kelsey Harvey, Manager, Tobacco Experiment Station.
5. Annual Report, Bulawayo Demonstration Station, 1925-26, by H. W. Hilliard, Assistant Agriculturist.
6. Two Important Legume Crops.
7. Growing Potatoes in S. Rhodesia.
8. Haymaking in S. Rhodesia, by C. Mainwaring, Agriculturist.
9. Citrus Growing in S. Rhodesia.
10. Coffee Culture in S. Rhodesia.
11. Fresh Fruit, from Producer to Consumer.
12. Harvesting, Packing and Marketing of Deciduous and Tropical Fruits, by G. W. Marshall, Horticulturist.

H. G. MUNDY,
Chief Agriculturist.

Annexure "C."

Report of the Stock Adviser for the Year 1927.

The duties of this branch are principally of an advisory character embracing the selection of all breeds of cattle, sheep and pigs, together with the many duties involved in the culling and grading of herds for stock breeders in the Colony.

The increasing volume of advice given by correspondence is indicative of the greatly increased interest taken by all classes of the agricultural community in stock. This is due in part to the now realised necessity for the improvement of their cattle, together with the satisfactory prices obtained for all classes of stock during the year under review.

The itinerary work undertaken has been extensive, and requests for visits by breeders having as far as possible been met.

The policy of encouraging the improvement of breeds for dairy and beef purposes has been pursued with vigour, and the Government loan scheme for the purchase of pedigree and other stock by individual farmers has been of great assistance.

Cattle.—The rainfall over the Midlands and Matabeleland in the early part of 1927 was far below normal, with the result that winter feed was scarce and cattle were generally in low condition, and the losses from poverty, especially in Matabeleland, were considerable. The arrival of good rains in October eased the situation, and cattle generally are now in excellent condition.

During the year under review, prices of slaughter and other stock have had an upward tendency, and a majority of farmers are evincing increased interest in the breeding and feeding of cattle. Many breeders desire to improve their herds by direct importation of pedigree bulls from Great Britain, but owing to the continued outbreaks of foot and mouth disease, few animals have been imported during the year. The total number of cattle exported during 1927 amounted to 46,898 head, a decrease of 27,748 compared with 1926. The exports were made up as follows:—

Union of South Africa ...	7,244
For slaughter overseas	16,246
To England on hoof	200
Belgian Congo	21,642
Northern Rhodesia	219
Portuguese East Africa ...	1,347

The export trade to the Belgian Congo has increased from 11,845 head in 1926 to 21,642 in 1927, an increase of 9,797; of this number, 1,322 were intended for breeding purposes.

On the other hand, the export activities of the Imperial Cold Storage shows a decrease from 49,595 head in 1926 to 16,246 in 1927. It would, therefore, appear that the higher prices ruling for slaughter stock are not due to any greater demand, but rather to the scarcity of prime slaughter stock and the fact that many good breeding cows were slaughtered during the past three or four years, an ill-advised policy now making itself felt. Although the statistics for the year 1927 are not yet available, it is anticipated that there will be a decrease in the European-owned cattle, but as the movement goes hand in hand with the raising of the standard of the herds, it cannot be regarded as retrogressive.

During the year 200 live bullocks were shipped to England, of which no returns are available. A number of farmers in the grain growing districts are now stall-feeding bullocks with success, and the prices realised for the finished article left a good margin of profit for the feeders.

Dairy Stock.—The demand for good dairy stock continues, and many small farmers are taking advantage of the Government loan scheme for the purchase of pedigree bulls whose dams have high official milk records, also for high grade dairy cows. The Friesland seems to be the most popular of the dairy breeds. This is partly due to the fact that bulls of this breed whose dams have official milk records are easily obtained in the Union of South Africa at reasonable prices.

The number and breeds of cattle purchased under the Government loan scheme during 1927 are as follows:—

Friesland		South Devon		Shorthorn		Aberdeen Angus		Ayrshire		Red Poll		Hereford	
Bulls	Cows	Bulls	Cows	Bulls	Cows	Bulls	Cows	Bulls	Cows	Bulls	Cows	Bulls	Cows
20	198	2	...	2	111	1	32	3	5	4	23	1	11

Value.

Bulls ... £1,873 6s. 6d.; total number, 33.
Cows ... £5,102 1s. 6d.; total number, 380.

Sheep.—Owing to the good local demand for mutton, sheep farmers continue to take more interest in this branch of farming. A number of Suffolk Down rams have lately been imported from breeders in the Union, and when mated with the Blackhead Persian and native ewes the progeny make excellent mutton sheep.

The Merino sheep experiments being carried out at Plumtree, Inyati, Somabula, Rusape and Melsetter have not all been successful, and it was found necessary to remove two of the experimental flocks to other districts. Where attention has been paid to the regular dosing of the sheep with wire worm remedy and sufficient succulent food provided for the dry winter months, the sheep have done exceedingly well, which indicates that with proper management Merino sheep can be reared successfully in many parts of Southern Rhodesia.

Pigs.—The demand for good breeding pigs continues, with Large Black sows most popular for crossing with the Middle White and Berkshire boars, the progeny of which make good feeders and excellent bacon pigs. Where uniformity in sides is required, the Large White Yorkshire and Large Black crosses seem to be the most popular with bacon curers. The treatment of breeding pigs continues to receive attention, and although some progress in this respect can be seen, yet there is room for more improvement.

Although in some cases a good revenue is derived from pigs, very little is done to improve the conditions under which the pigs are housed, and are often neglected and penned up in open kraals without either shade or shelter. The attitude of such pig breeders is difficult to understand, as in most cases they are fully aware of the benefits to be derived from a comfortable piggery.

W. FLEMING,
Stock Adviser.

Annexure "D."

Report of the Dairy Expert for the Year 1927.

Dairying Season, 1927.—The first four months of 1927 were characterised by medium rainfall well distributed. Cattle were in good condition and dairy production was at its zenith. Everything appeared favourable for the production of dairy products far in excess of the previous record year (1926). Unfortunately, very heavy frosts occurred in May, June and July, and this not only told on the condition of the cattle, but in some places practically destroyed all natural winter grazing. Such winter feed as had been conserved was all too quickly consumed, and to add to the difficulties of the cattle owners, water in some of our best grazing areas became extremely scarce. Matabeleland suffered severely in these respects, and the production of cream throughout the winter season was disappointing. Good rains from October onwards afforded a certain measure of relief, but it was not until December that the dairy industry got into its stride once more.

Similar conditions prevailed all over South Africa, and our winter stocks of butter and cheese were depleted by insistent demands from the Union and the Congo. Owing to the great scarcity of butter, it became necessary for the first time for some years to import butter from overseas. Prices both of butter and cheese ruled at a high figure during the period of acute shortage, and those farmers who, by their foresight, were able to keep their dairy stock in condition reaped a rich reward.

Notwithstanding these very considerable setbacks, the production of Creamery butter shows a very slight diminution over last year's record total, and for the third year in succession has exceeded the very satisfactory total of well over one million pounds. This is almost exactly four times the amount of creamery butter produced five years ago.

Dairy Stock.—Enquiries for dairy stock grow in volume every year, and the Stock Adviser has had some difficulty in meeting the demand, which has been stimulated by Government stock loans to farmers. The demand for good dairy stock exceeds the supply, and those farmers who, by their initiative and foresight, have been able to offer locally-bred females and bulls, have had no difficulty in selling their dairy animals at most remunerative prices.

Frieslands seem to be the most popularly favoured breed, but Ayrshires, Red Polls and South Devons all have their advocates, and owing to the scarcity of pure-bred herds of these latter breeds, the Stock Adviser has had considerable difficulty in obtaining suitable animals.

There is happily a general tendency towards improvement in the treatment of dairy stock, and very few complaints as to the treatment of animals obtained under the Government loan scheme have been received from officers of the Veterinary Department. Hand-rearing of calves is becoming more common, and those farmers who have tried the system are satisfied that the results they obtain justify what little extra trouble hand-rearing entails. The better treatment of calves cannot be over-emphasised. Ill treatment and neglect means stunted, weedy animals. These are but poor foundations on which to build a dairy industry, and it is to be feared that many farmers in their haste to get a large cream or cheese cheque lose sight of the cumulative effects of their neglect.

As regards housing of dairy stock, there seems to be a good improvement on recent years. Many applications are being received for blue prints of cow byres. These designs, if carried into effect, will provide farmers with permanent and serviceable, if extremely plain, accommodation for their stock. Dairy stock, especially on the high veld, require shelter and feed in the winter, and suitable accommodation is essential. The expenditure on these buildings is not dead money, for it gives a very good return in the greater milk production of the cows housed therein, and the shelter afforded enables the cow to keep its condition and to give a good return in the spring, when the profit from dairy stock is at its greatest. Cows, on the other hand, which go through the winter without feed and shelter are usually emaciated at the end of winter, take a long time to regain their condition, and give practically no return when natural grazing is most plentiful.

Milk-Recording Schemes. — The milk-recording scheme continues to gain ground, and as the number of herds of good grade and pedigree dairy stock increases, this scheme is likely to gain further support. Unfortunately, owing to the fact that it is impossible to check weights of milk and the testing of butter-fat regularly, Rhodesian milk records are not recognised as official by the Herd Societies in South Africa. A scheme, however, has been mooted to bring Rhodesian milk records into line with milk recording schemes in the Union, and if this scheme materialises, it is anticipated that milk recording will become more popular, and that the low standard of production of the average cow in Southern Rhodesia will be raised and ultimately will compare favourably with that attained by other countries.

Creameries.—There has been no increase in the number of creameries registered under the Dairy Produce Act of 1925.

All the creameries have had a fairly successful season, but, as has already been stated, the production of butter has not quite reached the record of last year. It may, however, be worthy of note that during December the production of butter in Mashonaland constituted a record.

During the year a movement to reorganise the Rhodesian Farmers' Co-operative

Industries was brought to a successful issue, and it is likely that each of their various activities, *i.e.*, the creameries, the bacon factory and the oil factory, will be run as a separate entity, and that each will be placed on a co-operative basis. This is a movement in the right direction, as many dairy farmers will probably be willing to become shareholders in a creamery venture, whilst they might not wish to take shares in either the Bacon Factory or the Oil Factory.

The increasing importance of dairying and the very large production of cream (especially in Mashonaland) has caused greater attention to be paid to the need for better equipment in all our creameries. Especially has this been the case in the Farmers' Co-operative Industries Creamery (Modern Creamery), Salisbury. This Creamery has been almost unable to cope with the cream which has been supplied during the flush season, but the installation of a new power churn has relieved the situation considerably.

The cold storage accommodation and floor space are, however, too limited to deal with the ever-increasing bulk of cream, and it is interesting to note that much-needed extensions are contemplated in the near future, and when these have been completed, Salisbury should possess a creamery which is worthy of the capital, and which will be able to cope with expansion in the dairy industry for many years to come.

The Gwelo Creamery, Gwelo, has been enlarged and provided with an up-to-date plant and new cold storages. These enlargements and improvements have facilitated the making of first-grade butter and greatly added to its keeping qualities.

The Model Dairy, Bulawayo, has practically been rebuilt, and is now one of the best equipped creameries in the Colony.

The Rhodesian Co-operative Creameries, Bulawayo, is a comparatively new building, and is well designed and equipped for the making of first grade butter for local use and for export. This creamery was especially hard hit by the cold dry winter, but since the rains is recovering very rapidly.

Less butter is being made on the farms, as the public have realised that a more uniform product is manufactured in a well-equipped creamery. Sales of creamery butter are therefore increasing and farm butter sales are decreasing. Generally speaking, farmers recognise that it pays better to sell their cream to a creamery rather than to make farm butter, and pay for salt, paper and railage, and have the trouble and expense of making it up.

Road Motor Services.—Nothing has been so conducive to the expansion of the cream flow to the creameries as the introduction of road motor services which have been inaugurated during the past year. These motor services open up country from which it was difficult and in some cases impossible to draw supplies of cream. For instance, cream is being sent from Chipinga to Salisbury and received in first grade condition. Other motor services are tapping the Charter and Enkeldoorn area, and enabling farmers, who a year or two ago were crippled for lack of rapid transport, to send their produce to Salisbury and to obtain good prices therefor.

These road motor services (of which no less than 15 will be in operation early in 1928) are bound to have a profound effect on the system of farming practised in this Colony, as farmers have now discovered that it is safer not to disregard mixed farming (the gospel of which has been preached by this Department for many years), and that it is futile and sometimes disastrous to pin their faith on the one-crop system. Some, who a few years ago appeared to look with feelings almost akin to contempt on dairying and its attendant branches of poultry and pig raising, have begun to realise what a monthly cheque means to a farmer. A ready access to a market has in the past been denied to certain districts, but with this handicap removed by the introduction of road motor transport, the future of mixed farming in this Colony seems assured.

Cheese-Making.—Although the number of cheese factories operating in 1927 is practically the same as last year, the total production has been affected by certain factors. The chief of these was the long, cold winter and the early frosts in May. Most factories continue, as a rule, to make cheese until the end of July, but owing to the frost and the consequent lack of grass, practically all cheese-making operations ceased ten weeks earlier than usual. Another factor affecting the manufacture of cheese in this Colony was the abnormally low price at which cheese could be purchased in the Union. Overproduction and low prices on the overseas market caused Union manufacturers to offload cheese at suicidal rates. Cheese could, at this period, be bought in Durban at as low a price as 8d. to 9d. per lb., which was of course considerably below cost price. The actual cost of making cheese has been debated for some years, and some exhaustive and illuminating figures on this point appear in the lately published report of the Board of Trade and Industries on the Dairy Industry in the Union of South Africa. It is there shown (p. 45 and Annexure "B") that many cheese factories in the Union were actually working at a loss, and that cheese which was being sold at 9d. to 10d. per lb. was costing over a shilling to produce. The average cost of making a pound of cheese (taking the average of the figures of twelve factories at which milk was bought) is stated in that report to be as high as 12.838d. per lb.

Cheese in the early portion of the year was being landed in Bulawayo from the Union at 10d. to 10½d. per lb., and this being the case, our own cheese-makers were compelled to close down. It was pointed out that they could do better by sending their

cream to a creamery than by trying to compete with Union cheese-makers who were selling at a ridiculously low price and thereby incurring serious losses. Many Union factories also closed down, or restricted their output, with the result that towards the end of the year an acute shortage of cheese prevailed throughout South Africa and prices rose accordingly. The disclosures made by the Board of Trade report have caused Union cheese-makers to be more circumspect when selling their cheese, and prices have hardened considerably. Rhodesian cheese-makers who enjoy a measure of protection due to the railway rates from the south should be encouraged to produce cheese freely during the present season.

It is highly important, however, that a well insulated, fly-proof and cool storeroom should be available, so that the cheese can be kept under suitable conditions pending its sale to the consumer. Every year there is a shortage from September onwards until the new season's cheese comes in. Cheese-makers should endeavour to cater for this shortage, as the importation of cheese at this season of the year is always excessive.

Town Milk Supplies.—Milk supplies to towns have during 1927 been plentiful. The use of motor transport has much extended the range from which milk can be supplied, and has had the effect of causing surplus milk to be available during the flush season.

Better housing, impervious floors, regular inspections and fly-proof milk rooms, have all had their effect in contributing to the state of hygienic milk production already reached. More attention should, however, be paid to clean clothing or overalls for native milkers and to cleaner milking. The grooming of milk cows should be encouraged, as well as a greater degree of personal cleanliness amongst native servants.

The medical inspection of all natives employed in dairies supplying milk to towns might with advantage be carried out more frequently.

It is interesting to add that for the first time in its history milking machines have been introduced into up-to-date dairies in the Colony. These machines are certainly effective and cleanly, and obviate all risk of infection due to uncleanly or unhealthy native milkers.

Statistics showing Comparative Returns, 1926-7:—

	1926	1927
Creamery Butter in lbs.	1,777,585	1,104,066
Farm-made Cheese in lbs.	150,000	110,000
Butter exported in lbs.	774,961	...

The Pig Industry.—The pig industry continues to make steady progress, and there is every indication that this branch of farming will play an important part in Rhodesian agriculture in the near future. The satisfactory prices realised for bacon pigs during the last few years have no doubt largely contributed to the development that has taken place in pig farming, but at the same time the importance of the latter as a lucrative adjunct to dairying is undoubtedly being more generally realised.

During the year under review farmers had little to complain of in respect of prices paid for bacon pigs, and the local bacon factories were kept well supplied. At the same time a large number of pigs, approximately 200 per month, were exported, chiefly from Matabeleland, to the Union, the Congo and Northern Rhodesia. A great improvement has been effected as regards quality and uniformity in the pigs as supplied to the factories, and improved methods of housing, feeding and management are being more generally adopted.

The most popular breed is the Large Black, and it is still common practice to cross this breed with the Berkshire for bacon purposes. The Middle White is also gaining popularity as an early maturing animal, and when crossed with the Large Black appears to produce an excellent bacon pig. In this connection it is gratifying to note that the Government Experimental Farms at Gwebi and Matopos will shortly be fully equipped to carry out pig breeding on a fairly extensive scale, and it is likely that as a result of experiments conducted at these and possibly other centres, valuable information will be forthcoming that will serve as a guide to the farmer in producing the most suitable type of pig for bacon purposes under Rhodesian conditions.

To enter into the export trade for bacon and hams it is essential that the Rhodesian product be uniform, and in this connection it is more than likely that we may have to follow the example set by Denmark, where the policy of encouraging the production of a standard type and breed of pig has led to a high degree of uniformity in type, size and quality being obtained, with the result that Danish bacon is in great demand on the overseas market.

Total Production of Pig Products.—The total production of pig products in the country as given by the bacon factories is as follows:—

Bacon and hams	591,486 lbs.
Other products (lard, sausages, etc.)	176,806 lbs.
Total	768,292 lbs.

This shows an increase of 41,497 lbs. on the 1926 figures, or an increase of 5.7 per cent.

No figures are as yet available to show the amount of farm-cured bacon produced during the year under review.

T. HAMILTON,
Dairy Expert.

Report of the Poultry Expert for the Year 1927.

General.—It is regretted that it is not possible to report much advancement in the poultry industry or improvement in the quality of the stock. This is partly the result of many farms and poultry keepers, who previously had been doing well with their fowls, either giving them up entirely, cutting down the number considerably, or neglecting them. This has been due to the time and labour necessary being devoted to other work, which gave promise of a better return, and also to new settlers taking up poultry in a small way, either to supply only sufficient eggs for household purposes or a very limited number for sale. The greater majority of new settlers have had to be taught the rudiments of poultry keeping, and the return in many instances has been poor. The work of this division continues to be therefore chiefly of an advisory and educational nature in the elementary work of poultry keeping. Research and experimental work, therefore, which is so necessary, is at present out of the question. A good deal of advice is given by correspondence and bulletins, but the major part of it is given personally on farms where the poultry can be graded and mated. It is not unusual to grade from 700 to 1,000 birds in one day.

There is some slight improvement among those who have poultry farms proper, and who depend solely or to a large degree upon the income from these for a living. Even some of these have allowed their stock and plant to deteriorate through devoting their time and money to some other industry. Towards the end of the year, however, it is satisfactory to note that a fair number have again turned attention to poultry.

Eggs.—The production of these, due to the above causes, has not been so good as it might have been, and eggs have been imported in increasing numbers. Most of the imports, however, are exported to the Congo, which provides an excellent market, which should be supplied by eggs produced in Southern Rhodesia, if poultry keepers would give more time and attention to their fowls and follow the advice so often given, with a view to increasing the supply and decreasing the costs of production. The difference in the number of eggs produced in the so-called scarce and plentiful seasons is still much too great. This difference could be largely reduced if poultry keepers would follow the advice given for obtaining a more uniform production with naturally lower and more uniform prices. Eggs have been this year as high as 5s. 10d. per dozen, which is absurd, considering the ideal climate and conditions for poultry keeping in Southern Rhodesia, but until those keeping poultry give their minds and energies to the work, the condition of scarcity and low production of eggs will continue. One of the aims of this branch has been to increase the production of eggs, decrease the imports and increase the exports, and for some years considerable advancement was made, but latterly the contrary has been the case, and during 1927 the imports have been greater than in any year since 1918. Unfortunately there is no really adequate means or organisation for conserving the surplus eggs during the glut (when they often sell at 9d. to 1s. per dozen) for sale during scarce periods.

The following is the production by farmers' fowls:—The number of poultry (including fowls, ducks, geese and turkeys) owned by farmers in Southern Rhodesia in 1926 was 157,288, and 375,225 dozen eggs from these were sold. In 1925 there were 164,519 head of poultry (a larger number, it will be noted, than in the following year), and the number of eggs sold from these was 308,158 dozen, *i.e.*, there were fewer fowls in 1926 than in 1925, but a greater production of eggs, showing an improvement in the productive qualities of the birds due to grading, selecting and better treatment. The figures for 1927 are not yet available. The exports for 10 months of 1926 were 551,847 eggs, of the value of £5,171. The exports for 10 months of 1927 were 1,000,049 eggs, of the value of £7,670, an increase for 10 months of 1927 as compared with 10 months of 1926 of 448,202 eggs, of the value of £2,498. The imports for 10 months of 1927 were 1,412,508, of value £10,659. The exports were to Northern Rhodesia and the Congo. The number of imported eggs retained and consumed in this country was 412,449, of the value of £989. It is impossible to obtain correct statistics of poultry and poultry produce, and thus estimate an accurate rise or fall.

A rough estimate of eggs sold by farmers from 1921 to 1926 inclusive is as follows:—

1921	2½ millions
1922	2⅓ millions
1923	3 millions
1924	3¾ millions
1925	3⅔ millions
1926	4½ millions

The number for 1927 will probably be less than 4½ millions, due to the increased attention devoted to tobacco growing, as numbers of farmers neglected their poultry, others discontinued keeping them altogether. There is every prospect, however, that in 1928 the production will be very appreciably increased.

With reference to exports and imports, the following figures speak for themselves:—

	Imports. Eggs.	Exports. Eggs.
1921	3,067,968	90,392
1922	2,403,464	231,301
1923	2,496,968	414,362
1924	984,136	1,114,868
1925 (C.B.) ...	1,910,000	749,435
1926 (10 months)	374,148	551,847
1927 (10 T.B.)	1,412,508	1,000,049

The sales of the Egg Circle only (*i.e.*, not including eggs from non-members) for July to December, 1927, show an increase of 42½ per cent. as compared with July to December, 1926, and 14,000 eggs are being sold by the Egg Circle per day.

Sale of Breeding Stock, Hatching Eggs and Day-Old Chicks.—The demand for these is good, and the sale of them is the most remunerative part of the poultry breeder's business. Good prices are usually obtained, especially by those who go in for trap-nesting or single penning, and are thus able to give particulars of pedigree and egg records. Apropos of this, the poultry branch has recently inaugurated the Southern Rhodesia Recording and Pedigree Register. Poultry breeders have been invited to co-operate in this scheme, and the result has been, so far, very gratifying. Each breeder undertakes to trap-nest or single pen a certain number of fowls (the minimum being 25). To these breeders the Poultry Experts pay surprise visits several times during the year, and if the proper treatment methods and recording are accurately carried out, recommendations are given by them for the sale of breeding stock, hatching eggs and day-old-chicks accordingly. All pedigree charts, records, etc., are at the disposal of the Poultry Experts at any time.

The Itinerary Work of this division is constant and very extensive, for not only have farmers and poultry breeders to be visited, but also those living on plots and householders in and around the towns, the majority of whom keep poultry. Visits are paid with the object of not only giving advice on the spot, but also culling, grading and mating of birds are carried out and demonstrations given. Undue advantage is often unfortunately taken. A number of visits have been paid to new settlers, but not to as many as there should have been, due to the fact that the majority do not wish at present to go in for poultry, their energies in most cases being confined to one crop only. It is certainly disheartening to come across, as one often does, new settlers who have not a single fowl, or who have only at best a few nondescript ones, and who have no wish or inclination to be able to supply even the house with eggs. The same feeling is experienced when visiting older settlers who have formerly done well with their fowls, but have neglected them and their housing, etc., and allowed their numbers to decrease materially owing to energy and time being devoted to some popular crop.

Poultry Shows.—Three of these were held during the year, viz., at Salisbury, Bulawayo and Umtali, in conjunction with the Agricultural Shows. The entries were good and the quality well up to standard. The breeders were well represented, but the farmers and small poultry keepers were not, although the utility bird is well catered for, and these are judged on laying and table qualities. Each show was patronised by a few, each of whom made large entries, rather than, as should be the case, a large number with a few entries each.

The Departmental Exhibit.—This was staged at the three Agricultural Shows. A very comprehensive one was exhibited at Bulawayo and Umtali. That at Salisbury Show was the largest and most comprehensive yet staged. Although it was purely of an educational nature and intended to act as such to the public, the majority seemed to treat it more as a spectacular show. Our endeavour is always to stage it in such a way as to attract as much attention and interest as possible.

The Eighth Annual Egg-Laying Test.—This commenced on 1st March, 1927, and concludes on 30th January, 1928. There were more entries than pens available, and places had to be balloted for. This has been the case since its inauguration. There are 20 pens of 5 birds in each. The majority were good and well up to standard, and have laid well, proving that eggs can be produced in large numbers on simple foods grown in the country, provided proper care, treatment and housing are provided. As a demonstration to farmers and poultry keepers it is invaluable. This test is certainly answerable to a very large extent for the better quality of the stock in the country, and for the greater production of eggs per bird; it also creates a spirit of competition and friendly rivalry.

The single pen system, it is hoped, will soon be adopted in the local tests, as it is more accurate, entailing less labour and time, and is more conducive to high production and a better control over the birds. Several of the poultry keepers of Rhodesia installed the single pen system of recording some time ago.

Diseases.—These are on the decrease, it is gratifying to report, due to better housing, hygienic methods and elimination of any birds seriously affected. There are still several diseases which show an epidemic tendency, such as coccidiosis, spirochoetosis, malaria, degeneration of the liver, diseases of the reproductive organs, chicken pox and septic pneumonia. These, with some experimental and research work, could be lessened in virulence and frequency, not to say in many cases prevented, and thus loss of good stock to the Colony obviated.

A. LITTLE,
Poultry Expert.

Annexure "F."

Report of the Cotton Specialist for the Year 1927.

The cotton crop throughout the country this past year, speaking in general terms, was a financial failure. Though prices were fair, few farmers obtained really profitable yields, and, except as a rotation crop, little cotton has been planted this season. Yet the prospects, for the future, of cotton as a mixed farming crop for Southern Rhodesia are bright. Distinct progress has been made with the investigational and breeding work at the Cotton Breeding Station, Gatooma. The careful study of the growing crop is now revealing the reasons for the failures of the past and the necessity for a completely new supply of seed giving plants resistant to jassid attack. Only when such seed can be issued to farmers will cotton-growing become fairly established.

Season 1926-27.—The planting rains were excellent in most parts of the country, and the climatic conditions throughout the season, though not ideal, were favourable. Two long drought periods in January and February were disturbing, but only the later planted cotton showed signs of having suffered. Probably largely as a result of these drought periods, plants were small to medium in size. Although the later rains were not at all excessive, and although there was little trouble from boll-worm attack, the shedding of young bolls and buds was enormous. As the season advanced plants showed signs of distress, and many of them eventually died. Bolls opened prematurely and imperfectly, were very light in weight, and produced a soft and generally weak lint. It was estimated on the Cotton Breeding Station, Gatooma, on plots of commercial Improved Bancroft, where careful records were kept, that 74 per cent. of the bolls formed were shed, and, of those retained, only 32 per cent. appeared to the eye to be mature and more or less opening properly. The extent of the boll shedding, together with the low weight and the immaturity of the bolls opening, gives the key to the very poor yields.

Jassid.—From experiments, records and general observations, there is now every reason to believe that the limiting factor to cotton growing in Southern Rhodesia is jassid attack; that, as the season advances, the growing plants are slowly poisoned by the feeding of these small plant-sucking insects. As a result the leaves cease to function properly and the plants become distressed. The earlier bolls struggle through to something approaching maturity; the last formed bolls are shed, and the remainder develop only imperfectly.

Fortunately it has been possible, at Barberton and at Gatooma, to isolate single plants, and from these plant strains resistant, and some almost immune, to jassid attack. These plants carry well and remain healthy, while susceptible plants near by succumb. It would appear that this resistance is in the main morphological.

Plant breeding work is slow, and much breeding and re-selection is necessary before a really uniform, relatively true-breeding strain of high quality will be available for general distribution; but, to satisfy immediate needs, the best of the resistant strains, those showing heavy yielding and desirable lint qualities, are being multiplied this year at Gatooma. Next season one or more should be available for farm multiplication, and the following season for a first general distribution. It is probable until such seed is available that only a small acreage in the country will be devoted to cotton, and that mainly as a rotation crop.

Other Insect Pests. — Promising results have been obtained in attempts to control the stainer (*Dysdercus* sp.), a very serious cotton pest, and the possibility of the Sudan bollworm (*Diparopsis castanea*) and the American bollworm (*Heliothis obseleta*) becoming serious pests in certain years is being borne in mind.

Cotton-Breeding Station, Gatooma.—A full report of the work at the Cotton Breeding Station, Gatooma, during the season 1926-27, and a discussion of the results obtained, is being published in the Empire Cotton Growing Corporation's "Reports from Experiment Stations."

Seed for 1927-28.—The great value of cotton as a rotation crop with maize is now widely recognised. It was felt by Mr. Cameron that some farmers would wish to continue with small acreages of cotton mainly because of this rotational value, and in the hope that seasonal conditions might cause the severity of the jassid attack to vary from year to year. He was of the opinion that little of the seed available in Southern Rhodesia was fit for planting, weakened as the plants have been by jassid attack. A supply of seed from the few fairly healthy crops, supplemented by a further limited quantity from healthy crops in Natal, was sold at 1½d. per lb., through the Secretary of the Department of Agriculture, to farmers who made application. It was stated that this seed was relatively sound, but that, as regards resistance to jassid, it was not likely to be superior to the local seed.

In May a visit was paid to Southern Rhodesia by Sir James Currie, Director of the Empire Cotton Growing Corporation, accompanied by Mr. Milligan and Mr. Jeffreys. In June Sir William Himbury, Managing

Director of the British Cotton Growing Association, and Mr. Astley Bell visited the country. They have since issued reports on the tours. They were greatly impressed with the very earnest desire of the farmers in Southern Rhodesia to establish the cotton growing industry on a sure foundation, and the great part such successful establishment would play in the agricultural prosperity of the country.

J. E. PEAT,
for Cotton Specialist,
Empire Cotton Growing Corporation.

"*Annexure "G."*

Report of the Chief Entomologist for the Year 1927.

Agricultural Entomology.

Pests recorded during the past year include the following:—

(1) **Cotton.**—Jassid, Stainers (*Dysdercus* spp.) and Aphis (*A. gossypii*). Bollworms were little in evidence last season.

(2) **Tobacco.** — "Wireworms" (Tenebrionidæ—*Trachynotus* spp. and *Psammodes*) were very prevalent. Surface Beetles (chiefly *Gonocephalum simplex*) did a great deal of damage on some farms. Attack by Leaf Miner (*Phthorimaea operculella*) and Stem Borer (*Phthorimaea heliopa*) was recorded in Matabeleland, probably associated with the sparse rainfall during the growing season. Cutworms (chiefly *Euxoa segetum*) have been injurious in seedbeds and on the lands during the present season. Root Gallworm (*Heterodera radicicola*) has appeared in seedbeds and affected the plants in the field. This pest may be on the increase in reference to tobacco, but the trouble appears to be chiefly traceable to seedbeds, to which more attention will need to be paid. A new tobacco pest, in the shape of the beetle grub (*Curculionidae* boring in the stem, came under notice in Matabeleland in December, and a very small Dynastid beetle is under suspicion as destroying tobacco seedlings; but so far this has not been confirmed. The activities of certain species of ants in carrying off germinating tobacco seed have been confirmed. These ants constitute quite a serious pest on some farms.

(3) **Maize.**—The Stalk Borer (*Glottula fusca*) has been much in evidence during the present season, and damage by the "snout beetle" (*Tanymecus destructor*) has been reported. In the Hartley district appreciable damage to the germinating seed by "wireworms" (*Trachynotus* spp.) was observed. On the whole the planting rains appear to have been sufficiently good to prevent severe loss from attack of insects on the seeds and germinating plants, but a number of complaints of *cutworm* damage have been received. The appearance of the so-called Army Mystery Worm (*Laphygma exempta*) was reported during December in reference to one farm in the Victoria district.

(4) **Citrus.**—The usual pests have been more or less in evidence, including Red Scale (*Chrysomphalus aurantii*), Soft Brown Scale (*Coccus hesperidum*), Black Citrus Aphis (*Aphis tavaresi*) and Citrus Thrip. *Heliothis obsoleta*, a caterpillar pest with many common names, in reference to its attack on tobacco, cotton, maize, etc., appeared in September for the third year in succession as a pest of citrus, attacking the young fruit.

(5) **Potato.**—The aerial portions of the plants of some crops have suffered considerably during the present season from the Tuber Moth (*Phthorimaea operculella*).

The numerous pests of the kitchen and flower garden, as well as of deciduous fruits, have been more or less in evidence, but a list of these appears unnecessary.

Research.

(1) **Pests of Cotton.**—These have received less attention during the past year. The economic effect of attack of insects other than Jassid cannot be studied to advantage until a variety of cotton is found or produced which will yield a profitable crop under Rhodesian conditions. Resistance to Jassid is clearly a necessary attribute in such a variety, but the whole question seems at present to be one for the plant breeder. Whilst, therefore, it is realised that there are a multitude of entomological problems associated with this crop, it is felt that until there is a clearer prospect of cotton once more coming into general cultivation in the Colony, the time of the entomologists can be utilised more profitably in reference to other problems.

The following matters in reference to pests of cotton have received some attention during the year, namely: (1) The bionomics of the Cotton Stainers (*Dysdercus* spp.) and their relation to Boll Rots; (2) native host plants of the Cotton Jassid and (3) relation of Jassid to premature reddening of the foliage. Some progress has been made in reference to (1), but nothing of outstanding interest. The structure and anatomy of the insects have received attention. With regard to (2), the results to date have been entirely negative, although considerable numbers of Jassids of other species have been collected from the native flora. The results under (3) are not conclusive, but evidence has been collected indicating that premature reddening, though possibly induced by Jassid, is rather a characteristic re-action of a variety (*e.g.* Improved Bancroft) than a direct result of the insect's attack. At least one other variety, namely, Egyptian, may suffer very severely without marked reddening of the foliage.

A search for Soudan Bollworm (*Diparopsis castanea*) in the Bindura and Shamva sub-districts in June gave negative results, but the significance of this is affected by the lateness of the season.

(2) **Pests of Tobacco.**—Research work in reference to pests of this crop has included:—

(1) Testing the value of weekly sprayings of seedbeds with arsenate of lead as a protection against (a) Cutworms (*Euxoa segetum*) and (b) Leaf Miner (*Phthorimaea operculella*)—still proceeding.

(2) Testing the value of protective spraying of the growing plants against Leaf Miner—still proceeding.

(3) Improvements in methods of using poisoned baits against Surface Beetles

attacking tobacco, including *Gonocephalum, Emyon, Zophosis* and other *Tenebrionidae* — considerable progress made.

(4) Testing the value of poisoned baits against the adult stage of the Tobacco Wireworms (*Trachynotus* spp.) and other observations on this pest—results satisfactory.

(5) Testing the value of farinaceous baits with a view to attracting "wireworms" (*Tenebrionidae*) in the soil—inconclusive.

(6) Testing the value of cyanide fumigation of the soil in seedbeds in reference to eradication of Root Gallworm (*Heterodera radicicola*)—results so far unfavourable.

(7) Tests in reference to penetration of heat into the soil from the "open fire" method of sterilising seedbeds. From these it appeared that a thorough firing may produce a temperature of 140 deg. F. and over to a depth of about six inches.

(3) **Pests of Maize.**—A preliminary investigation into the Maize Weevil problem was carried out in the Mazoe and Salisbury districts during July and August. The weevil was found breeding in the standing maize in the fields, and on the whole infestation in the field was heaviest near the maize sheds and sidings. Weevil was found in all the sheds, notwithstanding the fact that they had nominally been cleaned up, and weevil infested grain was found at most of the sidings, the "burning over" process having apparently failed of full effect. Maize dumps were found to be infested on farms of all sections. In some localities vlei lands were particularly affected.

Experiments with the miscible oil Harbas as a contact spray against adult weevils in sheds gave promising results, and may have a practical application in view of the difficulty of fumigating large open sheds.

(4) **Pests of Citrus.**—Some investigations *re* Citrus Pests were made early in the year, and included (1) *Citrus Thrip,* distribution and habits, periods of injury to fruit, relation to young foliage and alternative hosts. With reference to the last, what appears to be the same species was found on Castor Oil (*Ricinus*). (2) Observations on fumigation with *Calcium Cyanide dust* and *Zyklon* against scale insects. (3) Observations on the efficacy of a parasitic fungus (probably *Sphaerostilbe coccophila*) on Red Scale (*Chrysomphalus aurantii*) in the Mazoe Valley.

Owing to the engagement of an Entomologist by the B.S.A. Company to devote all his time to study of citrus pests, this branch has paid much less attention to pests of this crop than formerly, a welcome relief in view of heavy demands on the staff for other work. The B.S.A. Company's Entomologist, however, has kept in constant touch with this branch, and has been rendered all possible assistance.

(5) **General.**—Experiments with poisoned baits against *Cutworms* have not resulted in any practical advance on existing formulæ. Experiments with certain standard formulæ for poisoned baits against *grasshoppers* gave almost completely negative results. A few tests have been carried out in respect to the use of *soil insecticides,* and further tests are projected. Some cheap soil insecticide which will protect tobacco plants for a period after planting out is distinctly needed.

Medical and Veterinary Entomology.
Tsetse Fly.

(1) **Operations in Lomagundi District.**—The experimental operations inaugurated in 1925 have been prosecuted vigorously throughout the past year. The game fences have been maintained in good order, and elimination of game between the fences has proceeded unceasingly. The number of animals it has been necessary to destroy in the fenced area during the year has, however, amounted to a much smaller total than the number destroyed in the previous twelve months. The total reduction is to rather over one-half, but in 1926 the larger antelope, etc., formed nearly two-thirds of the total, whereas in the present year they form less than one-half. The reduction in the number of warthog and bush-pig is, however, slight. This reduction indicates the beneficial effects of the fences. Although a number of breakages have occurred, it is clear that the fences interfere effectively with ordinary game movements, and game paths along them in many parts show clearly enough that the wild game respects barbed wire in a considerable degree.

Close inspection carried out by three European inspectors during the year indicates favourable developments in regard to the distribution of tsetse fly. No tsetse at all has been met with south of the fenced zone, although special attention has been paid to localities where the insect was found last year. No tsetse have been found on the formerly affected block of farms on the east side of the Hunyani River. Within the fenced zone the insect appears to have retreated appreciably, and except close to and north of the northern fence, no "fly" has been met with within about eight miles of the Hunyani River.

With the exception of the northernmost farm, Chiwe, all the formerly affected farms east of the Hunyani River have been free from Trypanosomiasis throughout the year. Between the Hunyani and Angwa rivers losses occurred, especially during the first part of the year, on four farms, but it is doubtful in what degree these deaths are accounted for by infection previously contracted. The experience of the present wet season in reference to the health of the cattle in these localities is awaited before definite conclusions as to the effect of the operations are drawn.

In September hunting operations were extended to an area north of the fenced zone

bounded by the Hunyani and Mvume rivers and the northern game fence.

In the Sipolilo sub-district, where driving back of the game has been continued under the direction of the Assistant Native Commissioner, the losses amongst native-owned cattle are reported to have diminished considerably, viz., twenty-nine cases in 1927, as against one hundred and forty-one in 1926. It has not, however, been possible to follow the effect of these operations as closely as immediately around the fenced zone.

(2) **Operations, Gatooma Sub-District.**—The game fence along the boundary of the occupied country as far north as the northern beacon of the Rhodesian Plantations was completed on 30th April. Since that date it has been extended northward to the Umfuli River, and some twenty miles of a second fence ten miles to the west have been erected. The work has been greatly hampered by the necessity of cutting motor roads, the roughness of the country, lack of water and paucity of labourers.

The fences in this area consist of eight strands of wire with posts every ten feet, and constitute more formidable obstacles to game than the Lomagundi fences.

Operations against game were commenced in September with twenty-two native hunters under the direction of a European ranger, the idea being that by disturbing the area before the western fence was erected the amount of game enclosed might be reduced to a minimum.

Notes on the prevalence of tsetse fly in the demarcated zone have been collected by a special inspector with a view to supplying data to give some idea of progress later. There are considerable numbers of tsetse fly in some parts of this area.

The health of the cattle in the neighbourhood gives little indication of the relative position compared with last year, as the areas chiefly affected have been largely depleted of cattle and mechanical traction substituted. Actually the affected area appears to have extended slightly further east in certain spots.

(3) **Recrudescence of Trypanosomiasis along Gwaai River.**—Owing to reports received having indicated increase of both game and tsetse fly in the area of the former operations against game in the Gwaai-Shangani region, fears were expressed in last year's report that a recrudescence of the disease along the Gwaai River might be imminent. A few months later these fears proved to be well founded, herds of cattle between the Sikume River and Gwaai-Shangani junction being affected. The period of immunity presumably brought about by the operations has been thus limited to five years.

(4) **Effect of Organised Grass Fires.**—In accordance with a pre-arranged plan, an Entomologist proceeded to the Lomagundi district in July with a view to collecting notes on the tsetse fly to enable a more scientific test to be made of the effect of a deferred and organised grass fire. A premature fire in August unfortunately restricted the area available for the late burn. On 29th September the organised burn was carried out and was witnessed by the writer. From the point of view of a grass burn the operation was altogether successful, being favoured by a very hot day and a strong wind. The destruction of grass was practically complete over an area of about twenty-five square miles. With regard to effect on the fly, although some slight change in distribution was apparent, the average density appeared little affected. Figures collected indicated a comparatively small proportion of puparia destroyed, but this was also apparent as a result of the earlier burn. The percentage killed is judged insufficient to produce any practical benefit. Effect on the vegetation, apart from the grass, was not conspicuous. There were practically no thickets to be destroyed, and except for the scorching of the lower leaves of the trees (which bore young foliage at the time) and the bringing down of a number of old trees, there was practically no effect visible beyond the removal of the grass. It must, of course, be realised that no attempt was made to catch the flies after the fire, a proceeding which is hardly practicable on a large scale in this Colony. In point of fact, however, concentration of the flies following the burn was little in evidence.

A point of interest was the steady decrease in the density of adult flies throughout the period of the observations. This had the disadvantage of reducing the figures to be dealt with at the time of the later burn to somewhat unsatisfactory dimensions. The result of the experiment cannot, however, be said to be encouraging as far as can be judged at present.

Incidentally further notes on breeding haunts, parasitisation and natural infection of the flies with Trypanosomes were secured.

(5) **Inspection of Urungwe Sub-District.**—A special inspection of the Urungwe sub-district was carried out by a temporarily employed European with the object of obtaining information on the distribution of tsetse fly in reference to land settlement activities in that region. It is difficult to judge whether the fly has spread during recent years, as the map secured in the present instance is based upon actual observation of the flies themselves, whereas maps previously supplied appear to have been based to a greater extent on the occurrence of trypanosomiasis in stock. There are indications that the latter is extending southward in some places, but we have never yet been able to demonstrate the presence of fly by actual observation over the whole area affected by this disease.

(6) **Study of Parasites of Flies Allied to Tsetse.**—An Entomologist proceeded to the Gatooma sub-district in November in order

to commence a study of the parasites of flies allied to tsetse, the idea being to ascertain whether some of the species attacking tsetse were at all active as parasites of allied flies. Two species known also to attack tsetse were secured up to the end of the year, and the investigation is still proceeding.

(7) **Outbreak of Trypanosomiasis in Lupane Valley.**—An outbreak of Trypanosomiasis occurred early in the year amongst native cattle in the Lupane Valley far removed from any known fly area. An Entomologist and a Cattle Inspector proceeded to the area in August, but failed to find any tsetse fly. So far there is no apparent explanation of the outbreak.

(8) **Copper Queen Road.**—In view of anxiety expressed by a certain section of the Lomagundi farmers concerning the effect of traffic through the fly-infested country along the Sinoia-Copper Queen road, a visit was made to the Copper Queen Mine early in September, and several days were spent in exploring the road and vicinity and gathering local information. As a result, it was judged that the infestation of the road was too indefinite to constitute an appreciable danger. Actually no tsetse flies were seen in several motor runs along the road, and it was learnt that only occasional flies had been seen at long intervals, and none at all for several months. The country south and west of the Copper Queen was, however, very definitely infested.

(9) **Forest.**—Observations have been continued concerning the effect of ring-barking on the common *Brachystegias* of the Savannah forest of the Colony, and study of the forest flora in relation to tsetse fly has been continued.

Game Preservation.

At the beginning of the year instructions were received to gather all necessary information and to submit recommendations on the subject of game sanctuaries. In connection with this project, the district officials throughout the Colony were circularised and a mass of information concerning the present occurrence of game in the different districts accumulated, together with suggestions as to suitable areas for reservation. An effort was made to co-ordinate this information, and definite suggestions were submitted to the honourable the Minister in due course. The great difficulty in reference to creation of game sanctuaries lies in the fact that practically all the suitable areas are situated in what is known or thought to be potential "fly" country. In point of fact only one area amongst those apparently deserving of serious consideration is free from this objection.

Nurseries Ordinance, 1909.

Twenty-seven nurseries have been registered and inspected in due course during the year.

Importation of Plants Regulation Ordinance, 1904.

The following consignments have been dealt with by the Plant Inspectors at the various ports of entry:—

Bulawayo	4,750
Gwelo	305
Salisbury	2,137
Umtali	305
	7,497

One hundred and eight special permits for the introduction of plants, etc., into the Colony were issued during the year.

Annual permits for nurseries in the South African Union totalled sixty-one.

From April to November practically all plant inspection at Salisbury was carried out by technical officers of this branch.

Regulations in Other Countries Affecting Export of Plants from Southern Rhodesia.

Five permits only have been issued for the export of cotton to the South African Union. Thirty-seven certificates of cleanliness have been issued in respect to plants intended for export to other countries.

Rhodesia Agricultural Journal.

The first portion of a revision of a previous bulletin on the Tobacco Pests of Rhodesia appeared in the December number of the *Rhodesia Agricultural Journal*.

Agricultural Shows.

The entomological exhibit was placed on the benches at the Agricultural Shows at Bulawayo, Umtali and Salisbury, with officers of the branch in attendance.

Farms Visited.

Farms visited by the staff during the year totalled two hundred and twenty-six.

Lectures.

Lectures have been given during the year at the undermentioned centres:—

Salisbury South Farmers' Association, 26th October. Tobacco and Maize Pests.

Beatrice Farmers' Association, 27th October. Tobacco and Maize Pests.

Apprentices: Tobacco Experimental Station, 23rd November. Insects. (J. I. Roberts.)

Shamva Farmers' Association, 15th July. Maize Weevil Problem. (A. Cuthbertson.)

Banket Farmers' Association, 1st April. Tobacco Pests.

Chakari Farmers' Association, 21st April. Tsetse Fly.

Lomagundi West Farmers' Association, 13th November. Tsetse Fly.

Golden Valley Farmers' Association, 12th November. Tsetse Fly. (R. W. Jack.)

STAFF.

The technical staff during the year has consisted of the Chief Entomologist and three Entomologists.

Plant inspection duties have been carried out by certain Customs officials as heretofore, but approval has been obtained for the appointment of a whole-time Plant Inspector for the port of Bulawayo, where the volume of plant imports now justifies this procedure.

A European ranger has been employed in the fenced area in Lomagundi during the year, and a ranger has been appointed in connection with similar operations in the Gatooma area. Five other Europeans have been employed temporarily to carry out inspection work in reference to tsetse fly. Two others have been engaged in erection of the game fences.

R. W. JACK,
Chief Entomologist.

Annexure "H."

Report of the Irrigation Engineer for the Year 1927.

I have the honour to submit the annual report on the work performed by the Irrigation Branch.

The year under review has been one of great expansion in this branch, due mainly to the large extensions in the boring operations, but in all other directions also there has been a marked increase in the demands made upon the staff.

The activities of the branch are of a very varied nature, and concern all general engineering matters connected with farming operations and water supply, the advisory work in connection with pure irrigation matters forming only a small portion of the ordinary routine.

The following is a summary of the expenditure controlled and administered by this branch during the year in respect of work performed for the agricultural and other Departments, exclusive of ordinary advisory work:—

	£	s.	d.
General boring operations	12,000	0	0
Purchase of drills... ...	10,500	0	0
Development and installation of water supplies in native reserves	12,800	0	0
Installation water supplies Government institutions and townships	4,784	0	0
Water supplies Limpopo stock route ...	700	0	0
Engineering works for Agricultural Department	972	0	0
Surveys and estimates water supplies Government institutions	4,800	0	0
Hydrography and meteorology	845	0	0
	£47,401	0	0

These matters will be dealt with in more detail in the various sections of the report.

Engineering Advice to Farmers and Others.—The demand made by farmers and others for engineering advice and assistance has shown a marked increase during the year.

In addition to surveys and reports on irrigation, water power schemes and soil erosion, advice is sought and given on a great variety of general engineering subjects, among which may be mentioned construction of tobacco barns and general farm buildings, dipping tanks, well sinking, water supplies, and labour-saving appliances on farms. The following summary shows the number of visits paid to farmers in connection with advice on these matters, together with the totals of new land reported on as irrigable:—

Number of farms visited ...	197
Acreage of new irrigable land investigated	3,007
Total acreage of irrigable land investigated to end 1927	46,898

In addition to the above, nine farmers' association meetings were attended, and addresses delivered on soil erosion and small irrigation schemes.

Two lectures on earthen storage dams and building construction were also delivered to the apprentices at the Tobacco Experimental Station.

Plans and estimates were prepared in connection with the construction of farm buildings and repairs to road bridge on Matopo Estate.

The installation of a power plant at Gwebi Government Farm and an electric light plant at Terminus Hotel, Matopo, were also supervised by this branch.

At the request of Lands Department, plans and specifications of four type farm homesteads for new settlers were prepared.

Surveys and estimates were prepared in connection with 18 water supply installations for small townships and Government institutions, and in the case of eight of these the construction was supervised, necessitating frequent visits.

Experiments in connection with fuel economy in tobacco barns were carried out at the Experimental Station towards the end of the year.

Special Reports and Investigations.—At the request of the Rhodesia Base Metals Syndicate, the Assistant Irrigation Engineer accompanied one of their engineers in April to conduct a reconnaissance with a view to determining the power possibilities at Kariba Gorge. These investigations showed that the power possibilities were not as good as had been anticipated.

In October, at the request of the Rhodesia Land, Cattle and Ranching Corporation, the Boring Superintendent and the Assistant Irrigation Engineer toured Nuanetsi Ranch and reported and advised on a policy for the development of water supplies in that area.

In May, accompanied by the Boring Superintendent, the Irrigation Engineer made

an extensive tour through the native reserves in Matabeleland and reported to the Chief Native Commissioner on measures to be adopted for the provision of temporary water supplies in the reserves, where a serious position had arisen owing to drought.

The Assistant Irrigation Engineer, accompanied by the District Veterinary Surgeon, Victoria, inspected the Limpopo stock route, and reported on the provision of suitable water supply installations, and has since supervised the work.

A special report was prepared for the Government on the Fort Victoria supply and light scheme, with special reference to the Government loan of £15,000.

A report on Irrigation Development in this Colony was prepared for the High Commissioner's Office.

Publications.—During the year the following articles were issued for publication by members of this branch:—

In "South African Journal of Science."

Preventative Measures against Soil Erosion in Southern Rhodesia, by P. H. Haviland, B.Sc. (Eng.).

Hydrographic Conditions in Southern Rhodesia, by N. P. Sellick, M.C., B.Sc.

Experimental Notes on Water Hammer, by R. H. Roberts, B.Sc. (Eng.).

The Variability of Rhodesian Rainfall, by C. L. Robertson, B.Sc. (Eng.), A.M.I.C.E.

And in the "Rhodesia Agricultural Journal."

Domestic Water Supplies and Sanitation on the Farm, The Hydraulic Ram (revised), Improved Tobacco Barn Furnace, by P. H. Haviland, B.Sc. (Eng.).

Cost of Pumping for Irrigation Farm Homesteads, by R. H. Roberts, B.Sc. (Eng.).

Ridge Ventilator for Tobacco Barns, Flue-Curing Tobacco Barns, Tobacco Baling Boxes, by B. G. Gundry.

Small Earthen Storage Reservoirs, by C. L. Robertson, B.Sc. (Eng.), A.M.I.C.E.

Rainfall returns and notes on the weather of the preceding month are published monthly in the *Journal*, and re-issued as a separate bulletin for distribution to meteorological institutions.

The Annual Meteorological Report for 1925-26 was issued as a Blue Book.

Owing to staff changes it was not possible to prepare the Hydrographic Report for the same year.

Irrigation.—The great majority of irrigation schemes advised on this year have again been for small areas which are intended to be utilised as a necessary adjunct to mixed farming. A detailed survey of the Chipoli Irrigation Scheme, whereby it is proposed to irrigate 800 acres of land on the left bank of the Mazoe River below Shamva, was carried out.

The area irrigable under this scheme has not been included in this year's total, as a preliminary survey in a former year showed that this area was potentially irrigable.

A preliminary investigation was made of a possible flood storage scheme for the irrigation of land on the Inyanda Block. This reconnaissance showed that a good storage site existed, and that an area of approximately 2,000 acres could probably be irrigated, but that a detailed survey would be necessary to decide whether the scheme was economically feasible.

The Odzi Farmers' Association requested that a preliminary survey should be undertaken to determine the approximate cost of a diversion scheme for the irrigation of a considerable area of land on the right bank of the river. Unfortunately, it was not possible to carry out the survey this year, but it is intended to do so early in the coming winter.

The utilisation of existing irrigation facilities to permit of the early planting of summer crops, particularly tobacco, has been extensively developed this year in areas where the early rainfall is erratic.

The only area in which an irrigation scheme is being wholly utilised for summer irrigation is in the Sabi Valley, where the results have been so satisfactory that additional areas are now being brought under irrigation. It is claimed that the early planting of tobacco under irrigation will enable the labour supply and barn accommodation to be used to greater advantage, with consequent economy of production, as the planting and curing of the crop can be spread over a longer period.

Soil Erosion.—Requests for advice on the measures to adopt to check soil erosion still continue to increase, but at present it is mainly farmers in districts adjacent to Salisbury who are putting into practice the soil erosion protection measures recommended by this branch.

The number of visits to farms on soil erosion problems totalled 60 this year.

The fact, however, that the farmers who adopted protective measures some years ago are still extending their operations to protect further areas of their land is proof that these measures are both beneficial and economical.

The following extract from a letter recently received from Mr. George Rattray, of Kingston Farm, Bindura, who was one of the first farmers to construct contour ridges, is enlightening:—

> "I have been meaning to write to you for some time past on the subject of contour ridging, as I have heard doubts expressed as to the usefulness of them. On my part I am only sorry I did not construct them years ago and save the thousands of tons of top soil that have gone down the river. There has not been a

break in any of the 22 on Kingston—of a total of 10,000 yards. I sincerely hope you will continue to impress on farmers the great gain there is in contour ridging for the small initial outlay."

During the flood season samples of river water are collected in various localities and forwarded to this office for the determination of their silt content. This data will supply valuable information in connection with storage dams, and will be indicators of the ravages of soil erosion.

Boring in Native Reserves, Crown Lands, Farms, etc.—Five additional drills of the combined percussion rotary type were brought into operation during the year, making 11 in all engaged on boring work throughout the Colony.

The additional drills came into commission at different periods throughout the year, and allowing for this, the strength was equivalent to 7 1-3rd drills working for a complete year.

The summary of footage drilled, cost per foot and aggregate yield per 24 hours is as follows:—

The total depth drilled	10,524 feet
Footage drilled per working month per drill	119.6 feet
Number of boreholes sunk	84
Average depth per borehole	125.3 feet
The average charge, including casing (all boreholes)...	26/- per ft.
The aggregate yield of successful boreholes	731,932 gallons per 24 hours
Percentage of boreholes sunk yielding supplies of over 2,000 gallons per day	69.0%

In the following summary is shown the costs of drilling under differing conditions as to supply of transport, labour, etc.:—

	Government farms.	Private farms.	Government institutions.	Crown lands.	Native reserves.
	Transport and labour supplied by applicant.		Transport and labour supplied by Government.		
Total depth drilled	521 ft.	2,202 ft.	289 ft.	4,862 ft.	2,650 ft.
Footage drilled per working month per drill	130.25 ft.	142.0 ft.	96.3 ft.	123.1 ft.	101.9 ft.
Number of drill months	4.0	15.5	3.0	39.5	26.0
Number of boreholes sunk	5	19	3	44	13
Average depth	104.2 ft.	115.9 ft.	96.3 ft.	110.5 ft.	203.8 ft.
Average charge per foot (including casing)	18/8	17/6	40/9	26/7	31/8
Percentage of successful boreholes ...	80 per cent.	73.7 per cent.	33.3 per cent.	63.6 per cent.	76.9 per cent.

These costs are very low when the hard and fractured nature of the formations, in which drilling has to be carried out in this country, are considered, and reflect great credit on the Boring Superintendent, Boring Inspector and drill personnel.

The staff of the Boring Section consists of the Boring Superintendent, a Boring Inspector, 13 drill foremen, 1 assistant drill foreman, and 1 learner. Three of the drill foremen are locally-trained Rhodesian youths.

The appointment of a Boring Inspector for supervising the drills in Matabeleland has been amply justified by the results. Without this appointment it would have been impossible for the Boring Superintendent to have efficiently supervised the field operations.

The average cost per foot to private applicants is 2s. cheaper than the corresponding figure in the previous year's operations. This result is due to the fact that owing to the large number of drills now available it is possible to carry out private applications all over the Colony with the minimum amount of extra expense for railage and transport charges. The higher average charge per foot for all boreholes is due to the boring on native reserves being included in the general schedule for the first time this year.

The boring charges on unoccupied Crown lands and in native reserves are higher than can normally be expected, owing to the fact that the severe drought of the previous season necessitated extra transport being hired to keep the drills supplied with fuel and water. Further, eight of the boreholes on Crown lands were near the fly belt in the Golden Valley area, and exorbitant rates had to be paid for the hire of transport, owing to the risk of infection to the cattle.

As regards native reserves, the conditions were particularly severe in the Gwaai Reserve, and it was difficult to keep the drill operating for full time—the expense is also higher here, as two deep boreholes were sunk through the basalt, the one being 502 feet and the other 417 feet in depth. Good supplies were obtained in each of these holes. Future drilling in a difficult portion of the reserve has in this manner been simplified, as the thickness of the

basalt and the existence of good supplies in the underlying formation has been proved.

The low percentage of successes on the unoccupied Crown lands is mainly due to the difficulties experienced in the Trelawney area, where the percentage of successful holes was only 42.9 per cent. of those sunk, whereas in the remaining Crown lands the percentage of successes was 73.3 per cent.

The average cost of developing a good supply on an unoccupied farm is approximately £240, as shown by the figures in the schedule.

The low percentage of successes shown for Government institutions is wholly due to the fact that two boreholes were sunk without success in a restricted area in the neighbourhood of Milton School. The high cost of drilling is due to the heavy charges for fuel and transport in the neighbourhood of a town.

The following table shows the total revenue and expenditure to date on such of the drills as have been running for a sufficiently long period to render such an analysis possible:—

Drill No. 3.—

	£	s.	d.
Boring charges, 1/1/27—31/8/27	1,244	15	0
Pump material supplied and erected	71	12	7
Total revenue	1,316	7	7
Total expenditure	994	14	5
Profit, 1/1/27—31/8/27	321	13	2
Loss on running, 1/4/25—31/12/26	105	3	9
Profit, 1/4/25—31/8/27	£216	9	5

	£	s.	d.
Working costs, 1/1/27—31/8/27	941	2	11
Cost of pump material	53	11	6
	£994	14	5

The depreciation allowed on the plant for the period of 29 months' working has been £468 12s. 11d., so there is a net loss standing against the drill of £252 3s. 6d.

In addition, there has been a total capital expenditure of £103 6s. in respect of plant supplied to the drill which does not figure in the working costs, and has not been charged against Loan Vote. The drill was transferred to native reserves work on the 1st September, 1927, and all expenditure since that date has been charged against Loan Vote D.

Drill No. 4.—

	£	s.	d.
Boring charges, 1/1/27—31/12/27	1,735	15	6
Pump material supplied and erected	109	5	2
Revenue (1927)	1,845	0	8
Expenditure (1927)	1,511	17	8
Profit (1927)	333	3	0
Profit, 1/12/25—31/12/26	192	11	3
Profit, 1/12/25—31/12/27	£525	14	3

	£	s.	d.
Working costs, 1/1/27—31/12/27	1,424	7	9
Cost of pump material	87	9	11
	£1,511	17	8
Stores on hand	£140	4	5

The depreciation allowed on the plant for the period of 25 months' working has been £525 14s. 3d., so the profit has just served to cover the depreciation.

A higher amount of depreciation than is normal has been allowed on this drill, as it is an American pattern and not of sound workmanship. In addition, there has been a total capital expenditure of £110 17s. 11d. in respect of plant supplied to the drill which does not figure in the working costs and has not been charged against Loan Vote.

Drill No. 5.—

	£	s.	d.
Boring charges, 1/7/26—31/12/27	2,580	19	10
Pump material supplied and erected	271	0	0
Total revenue	2,851	19	10
Total expenditure	2,477	2	1
Profit, 1/7/26—31/12/27	£374	17	9

	£	s.	d.
Working costs, 1/7/26—31/12/27	2,277	9	1
Cost of pump material	199	13	0
	£2,477	2	1
Stores in hand	£209	15	9

The depreciation allowed on the plant for the period of 18 months' working has been £374 17s. 9d., so the profit has just served to cover the depreciation. In addition, there has been a total capital expenditure of £79 10s. 9d. in respect of plant supplied to the drill which does not figure in the working costs and has not been charged to Loan Vote.

Drill No. 6.—

	£	s.	d.
Boring charges, 1/8/26 31/12/27	2,455	1	4
Pump material supplied and erected	191	9	0
Total revenue	2,646	10	4
Total expenditure	2,311	13	0
Profit, 1/8/26—31/12/27	£334	17	4

	£	s.	d.
Working costs, 1/8/26— 31/12/27	2,173	7	3
Cost of pump material	138	5	9
	£2,311	13	0
Stores on hand	£186	7	9

The depreciation allowed on the plant for the period of 17 months' working has been £334 17s. 4d., so the profit has just served to cover the depreciation. In addition, there has been a total capital expenditure of £96 10s. 5d. in respect of plant supplied to the drill which does not figure in the working costs and has not been charged to Loan Vote.

Drill No. 7.—

	£	s.	d.
Boring charges, 1/5/27— 31/12/27	1,121	4	0
Total expenditure	981	2	10
Profit (8 months)	£140	1	2

	£	s.	d.
Working costs	981	2	10

This balance of revenue should serve to cover the depreciation on tools and plant.

Water Supplies, Native Reserves. — In addition to the boring operations in the native reserves, windmills, tanks and troughs were installed at all permanent supplies, thus developed at a total cost of £2,625.

As a result of the drought, it was necessary to arrange for temporary water supply installations in certain reserves at a cost of £674.

A fool-proof hand-pumping attachment was designed for use on windmills, and a number installed at a cost of £285, in reserves at a low altitude where the lack of wind at certain critical periods of the year rendered the windmill installations useless.

Owing to the large influx of natives into the reserves of recent years, it is essential to render new areas available for native settlement by this type of work.

Fuller details of the work performed is dealt with in the appendix to the annual report of the Chief Native Commissioner.

Water Supply Installations for Government Institutions and Townships.—A number of water supply schemes for Government institutions were investigated and reported on. Estimates were prepared and the construction supervised of such schemes as reached that stage.

Works have been carried out and supervised at Prince Edward School, Amandas Camp, Shabani, Domboshawa, Plumtree, Norton Police Camp and Fort Usher, involving an expenditure of £3,820.

In addition, the Umvuma Township water and light scheme was supervised during construction, the cost of the completed scheme being £964.

Reports and estimates were also prepared for water supply installations at Rusape, Beatrice, Zaka, Salisbury Hospital, Bikita, Enkeldoorn, Sinoia, Selukwe, Shamva and Limpopo Township.

Meteorology.—The work of the meteorological and hydrographic sections is supervised by the Assistant Hydrographic Engineer. The routine meteorological work consists of the classification of data obtained from local observers relating to the rainfall and climatic conditions in the Colony.

The change in the number of reporting stations was as under during the year:—

	Number on 31/12/26.	Number on 31/12/27.
Stations with automatic instruments	3	3
Barometric stations	8	8
Thermometric stations	36	41
Rainfall stations ...	463	490
	510	542

The data obtained are checked and tabulated in a convenient form for general information and scientific purposes.

The regular information published during the year consists of the following:—

(a) An annual Meteorological Report.
(b) A monthly Weather Report in the *Agricultural Journal.*
(c) A weekly summary of rainfall.

(d) A daily Weather Report and Future Outlook is issued during the rainy season and telegraphed to 37 centres for distribution.
(e) Daily records from five barometric stations are sent monthly to Kew.
(f) A summary of our mean seasonal rainfall and deviation from normal is sent to the Indian Meteorological Department in April. This information is utilised for the forecast of the Indian monsoon rainfall.

Special weather messages were requested and supplied during the progress of the combined flight of British and Union Air Force 'planes.

Numerous enquiries from new settlers regarding rainfall and climatic conditions in various areas and methods for lightning protection were dealt with. The section dealing with rainfall and climatic conditions in this Colony was revised for a new edition of the "Settlers' Handbook." A critical examination of the methods to be adopted for preventing excessive humidity in the Automatic Telephone Exchanges at Salisbury and Umtali was undertaken at the request of the Postmaster General and improvements suggested.

Seasonal Forecast.—During the year extensive investigations were undertaken with a view to obtaining further prior correlation co-efficients which would improve the seasonal forecast. These investigations were mainly directed to determining whether prior temperature conditions elsewhere would afford an early indication of probable ocean temperatures off the South African coasts during the summer, and thus be indicators of our seasonal rainfall.

The only promising factor obtained, out of a great number examined, was that of South Orkneys temperatures, very high positive correlations existing between this factor and our seasonal rainfall 18 months and 30 months subsequently for the period 1903 to 1920.

Unfortunately the later data received since 1920 show a complete reversal of sign with equally high negative correlation, so the subject will have to be investigated further before this factor could be utilised.

Daily Forecast.—Farmers are gradually becoming more interested in the use of the daily forecast, with the result that the numbers utilising it are increasing yearly.

The weather maps for previous seasons have been completed from all the later data available, and the mean daily rainfall in this Colony summarised in these maps.

A critical examination was made with a view to determining the accuracy of the past daily forecasts and the correlation of rainfall experienced with definite weather types. This examination confirmed the belief that the daily forecast is reliable and therefore of general utility.

Hydrographic.—The routine work of this section comprises the collection of data relating to the storm and winter flow conditions of the chief rivers in the Colony.

The data is studied in conjunction with the rainfall and physical conditions of the catchments with a view to supplying reliable information regarding the potentialities of the different river systems for irrigation and power purposes. The value of extensive records of this nature will be fully proved in the future.

The futility of designing expensive irrigation schemes without comprehensive hydrographic data is being now fully realised in the Union of South Africa. Even at present the call for this type of information in connection with the administration of the Water Ordinance is in excess of what can be supplied. The information is obtained by means of:—

(a) Automatic recording instruments at gauging weirs and dams.
(b) Daily records of river level by local observers.
(c) Individual gaugings by members of the engineering staff when on tour.

There are 11 gauging stations of the first class in existence, an increase of three over the previous year.

Water Ordinance.—Questions in connection with the drafting of the proposed amended Water Ordinance occupied a considerable amount of time during the early portion of the year.

The amended Ordinance as eventually promulgated is a considerable improvement on prior legislation, as the control of all public water for irrigation, power, mining and urban purposes is now vested in one authority, viz., the Water Court.

During the year the writer sat as Engineering Assessor on five Water Courts; two of these were special Courts for Fort Victoria and Umvuma water supply applications, and for railway supply purposes at Wankie. The remaining Courts were for the consideration of ordinary farm applications in Salisbury, Mazoe, Makoni, Umtali and Melsetter districts. In all, 47 days were occupied on Water Court duty.

The Assistant Hydrographic Engineer reported on 61 water-right applications. The reports submitted dealt with such matters as the river system affected, water available for apportionment and effect of proposed applications on existing grants.

Grants were issued for the irrigation of a total of 1,702 acres.

Staff.—The staff was practically at full strength during the year, with the exception of absences due to vacation and sick leave.

Acknowledgment is made of the loyal services rendered by the whole staff of this branch during the year.

C. L. ROBERTSON,
Irrigation Engineer.

Annexure "I."

Report of the Chief Chemist for the Year 1927.

General.—The work of this branch during the past year has consisted mainly of routine analytical work, together with educational and advisory work by correspondence and interview.

A study of previous reports issued by this branch shows that the number of samples submitted for analysis has been progressively increasing year by year.

During the period under review, however, a rapid increase has taken place, particularly in the number of soils submitted, and the record of work for the year 1927 shows that the number of samples received for analysis and report is over one hundred per cent. in excess of the number received during the previous year.

This large increase is due to the fact that the farmer is realising that by seeking the advice of the agricultural chemist he is able to ascertain the most suitable of his soils for any specific crop and also to receive guidance in the arrangement of his manurial programme so as to maintain the fertility of his soil, and at the same time to obtain the most economical return for the money expended in the purchase of artificial fertilisers.

Requests by farmers and farmers' associations for visits of an officer of this branch to their farms and to lecture at their associations have been numerous, and, while every effort has been made to meet the demand, it has been impossible to meet all the requests, particularly in the case of personal visits to farms, owing to the pressure of work in the laboratory.

The application of chemistry in the science of agriculture covers a very large field, and as a consequence the assistance of the branch is frequently in demand, not only by those actively engaged in the practice of agriculture, but also by colleagues of the Agricultural, Veterinary and other Government Departments.

The routine work carried out by the branch may be classified as follows:—

1. Analyses of samples taken under the Ordinance governing the sale of fertilisers and farm foods.
2. Standardisation of glassware under the Dairy Produce Act, 1925.
3. Analyses of cattle dips and toxicological analyses for the Veterinary Department.
4. Analyses of soils, waters, etc., sent in by farmers.
5. Advisory work by correspondence and interview on all problems coming within the sphere of agricultural chemistry.

Manures and Fertilisers.—Thirty-three samples were analysed during the year, of which eighteen were taken under the Fertilisers, Farm Foods, Seeds and Pest Remedies Ordinance.

Of these latter, three samples were found to be lower in composition than registered and below the limits allowed under the Act; whereas one sample was much higher in composition and was evidently wrongly labelled. One of the samples not conforming to the guarantee was found to be unregistered. In view of the above, a notice was published in the Press and in the *Rhodesia Agricultural Journal* calling attention to the regulation in regard to the registration of fertilisers and farm foods, and a short article published in the *Agricultural Journal* emphasising the necessity of vendors acquainting themselves with the provisions of the law in respect to the sale of fertilisers and farm foods.

Farm Foods.—Eight farm foods registered under the Act were analysed. All were found to conform to the guarantee.

Standardisation of Glassware.—In all, ninety-one pieces of glassware, consisting of eighty-nine Babcock cream testing bottles and two cream pipettes, were standardised and marked as required under Government Notice No. 279, 27th May, 1927.

Cattle Dips.—Twenty-two samples were analysed and reported upon.

Toxicological Analyses.—Of the seventy-three samples analysed under this head, sixty-one were samples of viscera obtained from cases of suspected poisoning. One sample consisted of salt which was believed to be causing the death of dairy cows. This salt was found to be nitrate of soda. Arsenic in considerable quantities was found in thirty-five of the samples and in traces in thirteen of the samples. One sample was found to contain copper. No poison was detected in the remaining twenty-three samples.

Soils.—In addition to the general advisory work upon soils, four hundred and ninety-eight samples of soil and one hundred and twenty-six samples of sub-soil have been submitted to the branch for examination and report.

Of the four hundred and ninety-eight soils, forty-nine were submitted by the Department of Lands. These samples represented virgin soil from Government farms in newly surveyed areas, and reports were requested as to the inherent fertility of the soils and their probable suitabilities for tobacco and other crops.

The other samples were submitted by farmers, and in the majority of cases informa-

tion was desired as to the suitability of the soils for tobacco culture and for advice as to manurial treatment.

Limestones and Travertines. — Seven samples were submitted under this head. Advice was given as to their suitability for agricultural purposes.

Vegetable Products.—The samples under this head were usually submitted for information as to their food values for stock.

Miscellaneous Samples. — The miscellaneous samples analysed total twenty-one. They include samples of wheat, locust poison, urine, cotton seed meal, iodine, salt, fish meal and lead cable with soil.

The salt was from a deposit found in Northern Rhodesia, and was found to be sodium sulphate.

The fish meal was submitted by a farmer, and was suspected of causing mortality among his pigs. Analysis showed the sample to be one of "Yellow Fish Meal," prepared chiefly from fish offal, and to contain a high percentage of sodium chloride. Fish meal of this description is not suitable as a pig food.

A sample of soil and a portion of lead cable were submitted for analysis by the Postmaster General, Salisbury, as it was found that the lead covering was attacked and corroded, presumably by some substance in the soil, as the corrosion only occurs in one particular area. The corrosion of the lead was found to be caused by an excess of nitrates in the soil. Suggestions were made as to simple methods of protecting the cable.

Summary of Routine Analyses.—A list of the routine samples received and analysed during the year is presented in the following table:—

Soils	498
Sub-soils	126
Manures and fertilisers ...	33
Cattle-dipping fluids	22
Farm foods	8
Toxicological analyses	73
Forensic analyses	14
Vegetable products	21
Waters	10
Limestones and rocks ...	9
Miscellaneous	21
Glassware (standardised)...	91
	926

Investigational Work.—The abnormal increase in the amount of routine analytical work required of the branch during the period under review has occupied the whole time of the existing staff, and therefore very little time has of necessity been devoted to research work. One new experiment has been commenced, and the work previously in progress continued. The following are the experiments at present in progress:—

(1) Experiments in soil treatment and manuring for maize production. This experiment was laid down on the plots at the Salisbury Experiment Station in 1919, and the results up to the end of 1925 have been summarised and published by Mr. Blackshaw in the *Rhodesia Agricultural Journal*.

(2) Citrus fertiliser trials, which were laid down in 1923, are being carried out in collaboration with the British South Africa Company at their Citrus Estates at Mazoe, Sinoia and Umtali.

(3) An experiment was commenced on the extension plot at the Salisbury Experiment Station in December, 1926, the object being to determine the relative influence on the yield of maize of—

(a) a mixture of bone and superphosphate;

(b) rock phosphate.

The plots used in this experiment had previously been planted to maize for three years.

(4) Cotton Fertiliser Trials.—The manager of the Mazoe Citrus Estate kindly placed at our disposal ten acres of land at the Mazoe Citrus Estate for the purpose of conducting manurial trials on cotton. A scheme was drawn up after consultation with the Cotton Specialist, and it was decided to test the effect of five different dressings of fertilisers. The experiment was commenced on the 19th December, 1926. In April, 1927, it was found that stainers were in evidence, and that aphis and jassid were prevalent on all plots. On 17th May it was found that the damage wrought by aphis and jassid was so severe that the cotton was not worth reaping, and the experiment had to be discontinued. It is not considered advisable to carry out any further experimental work on cotton until seed is available from a more jassid-resistant variety of cotton.

(5) Asbestos Waste as an Ameliorant for Soil Acidity.—Recent work carried out in Canada seems to indicate that the dust produced in the milling of asbestos will correct soil acidity. As there is a large amount of asbestos waste available in this country, and soil acidity is one of the limiting factors in plant growth in the Colony, an experiment was commenced at Gwebi Government Farm in October to determine the influence of asbestos waste on the hydrogen-ion concentration of the soil. The asbestos waste being used in this experiment was kindly supplied gratis by the Rhodesian and General Asbestos Corporation, Ltd.

(6) Pasture Investigations.—While some preliminary work in connection with pasture and winter feed problems has

been done in past years, our knowledge of methods of improvement and maintenance of natural pastures in Southern Rhodesia is extremely limited. The importance of the mineral elements in the nutrition of farm animals is becoming more and more universally recognised, and the fact that the soils of this Colony are deficient in certain minerals makes it imperative that investigation into the mineral content of natural pastures should be carried out, as it is well known that deficiencies in the soil may be reflected in the herbage and again in the grazing animal. Many cases of malnutrition in animals, due to mineral deficiencies of pastures, have been recorded in South Africa and other parts of the British Empire, and evidence is available that certain diseases, known to be caused through mineral deficiencies, do occur among cattle in this Colony. Research work to determine the most economic methods of cattle raising and suitable crops for the feeding of both range and dairy stock, including experiments on methods of improving and maintaining natural pastures, is of primary importance to the agricultural community. Research work along these lines is being conducted in different parts of the Empire, and is being aided by grants given by the Empire Marketing Board. In view of the apparent importance of these problems to Southern Rhodesia, a tentative scheme has been drawn up in the hope that funds may be available at some future date to carry out similar investigations.

Publications.—The following articles were published during the year:—

(1) The Use of Fertilisers and Manures in Southern Rhodesia. *Rhodesia Agricultural Journal,* Dec., 1927.

(2) The Influence of Variations in the Ration on the Assimilation and Retention of Minerals in Farm Animals. *The South African Journal of Science*, Vol. XXIV.

Travelling.—Twenty farmers' associations' meetings were attended and a lecture delivered at each upon soils and the maintenance of soil fertility. Seventy different farms were visited, by request, during the year. Members of the staff were in attendance at the Agricultural Show held in Salisbury to explain the exhibits of the division.

Staff.—The following staff changes took place during the year:—

A. W. Facer, B.A. (Oxon.), F.I.C., Assistant Agricultural Chemist, transferred to Public Health Department on 14th May to take up the post of Government Analyst.

A. P. Taylor, M.A., B.Sc., appointed Assistant Agricultural Chemist, and commenced duty on the 20th December.

W. Torrance joined the staff on 1st September as temporary assistant, and ended his duties on 31st December.

The accomplishment of the greatly increased routine work of the branch during the period under review has only been possible by the existing staff working long after the recognised office hours, and acknowledgment is made of the loyal and efficient services rendered by my assistants during the year.

A. D. HUSBAND,
Chief Chemist.

Annexure "J."

Report of the Tobacco Branch for the Year 1927.

During the year under review, there has been a considerable extension and increase in the work of the Tobacco Branch.

The influx of new settlers who have taken up farms and have produced their initial crop of tobacco has been in a large measure responsible for the increased demands made upon the services of the officers of this branch.

In addition to the above, it may be stated that the older established growers also planted increased acreages, thereby contributing to what has proved to be the largest acreage that has yet been devoted to the tobacco crop in this Colony.

The climatic conditions were not considered very favourable during the opening period of the season, and fears were expressed as to the prospects of the tobacco crop; however, conditions improved during the month of January and a record crop resulted.

PRODUCTION OF TOBACCO IN RHODESIA, 1918-27.

	Virginia tobacco.			Turkish tobacco.		
Season.	Acres planted.	Yield in lbs.	Acre yield in lbs.	Acres planted.	Yield in lbs.	Acre yield in lbs.
1918-1919	3,198	1,179,932	369	999	287,680	288
1919-1920	5,546	2,435,994	435	1,958	511,633	266
1920-1921	7,888	3,192,662	404	1,643	554,320	337
1921-1922	9,007	2,880,104	318	1,167	302,255	259
1922-1923	7,758	2,540,942	327	1,296	269,839	208
1923-1924	7,001	3,426,390	489	1,002	452,070	451
1924-1925	7,550	1,987,382	263	891	418,522	469
1925-1926	13,160	5,313,186	404	755	346,623	459
1926-1927 *	29,172	18,631,069	638	992	633,488	638

* The figures relating to the 1926-27 season are now corrected and are as stated by the Government Statistician. The original estimates furnished a year ago by the Tobacco and Cotton Expert, as will be recollected, were: Virginia, 32,614 acres, 17,240,000 lbs., 528 lbs. per acre, and for Turkish tobacco, 600 acres, 180,000 lbs., 300 lbs. per acre.

ACREAGE AND YIELD BY DISTRICTS. Season 1926-27.

	Virginia tobacco.		Turkish tobacco.	
	Acres.	Yield in lbs.	Acres.	Yield in lbs.
Wankie...	...	...	...	...
Nyamandhlovu	181	96,505	15	4,714
Bulalima-Mangwe ...	4	1,000	11	6,000
Matobo	13	2,100	...	...
Umzingwane	5	4,240	...	...
Bulawayo	140	59,500	334	107,027
Bubi	173	47,440	8	1,875
Sebungwe	...	...	...	...
Gwelo	1,207	638,954	12	3,700
Selukwe	98	33,665	...	...
Insiza	61	8,450	...	...
Gwanda	...	...	1	...
Belingwe	...	...	...	...
Victoria	66	26,654	...	20
Chilimanzi	189	76,099	...	...
Hartley	5,002	2,907,119	122	39,347
Lomagundi	4,050	3,568,751	401	437,150
Mazoe	5,803	3,448,963	6	2,000
Salisbury	3,572	2,227,088	62	24,800
Marandellas	4,061	2,529,181	...	...
Charter	177	138,990	...	...
Gutu	153	73,680	...	...
Ndanga...	44	21,395	...	...
Chibi	12	1,800	...	..
Bikita	17	11,500	2	750
Melsetter	16	9,940	1	200
Umtali	155	58,015	12	4,905
Makoni	3,043	2,038,265	5	1,000
Inyanga	...	...	...	...
Mrewa	518	375,835	...	...
Mtoko	10	4,000	...	...
Darwin	402	221,940	...	...
	29,172	18,631,069	992	633,488

During the year 1927 the officers of the Tobacco Branch made in all 6,500 visits to farms, attended 32 farmers' meetings and eight special meetings at which matters relating to tobacco were discussed, 23 lectures on tobacco culture were delivered, and numerous demonstrations in field work and curing were carried out, all the Agricultural Shows were attended and assistance rendered in the judging of the tobacco exhibited. At the height of the curing season there were numerous requests received for the advisory services of the tobacco staff, which unfortunately could not be fully complied with owing to a great number of demands being made from all quarters almost simultaneously. Correspondence has been heavy, and owing to pressure of work unavoidable delays have sometimes occurred in replying thereto. A system of weekly itineraries and monthly schedules was arranged by the Tobacco and Cotton Expert and put into force. This system ensured greater regularity in the sequence of visits made by the District Tobacco Advisers to each sub-division of the areas allotted to them. These District Tobacco Advisers made 5,667 visits to farms, an average of 8.5 visits to each farm, and travelled 112,619 miles. In so far as was possible all urgent calls from individuals were attended to as promptly as circumstances allowed. When requested to do so by the farmer, the District Tobacco Advisers inspected crops from which tobacco seed was being produced, and all crops considered to be producing good seed were certified as such. A limited quantity of seed was received at this office from growers desiring to have their tobacco seed cleaned by the Department of Agriculture. The bulk of tobacco seed used this season was both cleaned and treated by the various firms of chemists in Salisbury and in other towns.

Frequent visits were made to the Salisbury Tobacco Station, and in addition to ordinary advisory work, the field work of the apprentices was regularly inspected and the tobacco grown and cured by them was finally judged, at the end of the season, by the Tobacco and Cotton Expert, assisted by two of the Tobacco Advisers. A conference was held in June for the purpose of discussing fully all matters dealing with the work of the Tobacco Advisory Staff.

Before continuing, I wish to place on record that the services rendered by the Tobacco Advisers and the District Tobacco Advisers have been much appreciated, especially by the new growers.

The following is a brief *resumé* of the operations carried out on the Salisbury Tobacco Experiment Station:—

The total rainfall for the season was 20.45 inches, and the favourable distribution of showers brought the crop to full maturity. The yield varied according to fertiliser and other treatment; the highest yielding plot gave an acre yield of 1,500 lbs., and the lowest acre yield recorded amounted to 418 lbs. The number of plots put down to tobacco trials totalled 107 plots—the areas of which were somewhat varied. The total area under tobacco was 40 acres. This acreage is excessive for the housing accommodation available for the crop; provision is being made for more adequate housing for next year. As the total area of the farm is only 500 acres, it is not considered advisable to exceed a total of 40 acres for tobacco planting. The trials undertaken included fertiliser trials, spacing tests, varietal trials and crop rotations. Up to the present no actual research work has been carried out in connection with tobacco on the Tobacco Experiment Station.

The Mycologist is at present continuing preliminary investigations in connection with the possible control of white mould and bacterial disease by the application of sulphur and copper lime dust. These investigations were initiated towards the end of December, and will be continued until the end of 1927-28 season. Any results obtained will be published in due course by the Mycologist who is in charge of these investigations. About the same time as the above dusting experiments were commenced, the Irrigation Engineer's branch undertook certain investigations in connection with the thermal efficiency of tobacco furnaces and heat radiation from the barn. The first test was completed before the end of December, 1927, and further investigations are being continued.

In the training of apprentices a very valuable function is being performed on the Tobacco Experiment Station.

The two years' course is a practical one, and on completion of this period the youths concerned have a good working knowledge of the crop, and are competent to accept billets on tobacco farms. The hostel for apprentices on the station is always filled to utmost capacity, and applications in excess of available accommodation were received at the beginning of the new term.

In reviewing the general situation regarding the tobacco crop produced this year, it is found that the outstanding features are:—

(a) The total acreage devoted to tobacco was increased by 16,249 acres.

(b) The average acre yield for Virginia type tobacco was roughly 638 lbs., or approximately 149 lbs. more than the highest average acre yield previously recorded for Southern Rhodesia. The average acre yield of Turkish type of tobacco was approximately 638 lbs., which is an increase of 167 lbs. over the highest average yield previously recorded.

(c) Taking the crop as a whole, the quality of the leaf was good, and bacterial diseases (*Bacterium angulatum* and *Bacterium tabacum*) were not so prevalent as during the past few seasons. White mould (*Oidium*) was severe in the late planted tobacco.

(d) Mosaic disease was prevalent over a greater area than has been previously noted in this country.

(e) A big addition has been made to the number of commercial grading warehouses for handling tobacco.

(f) A large increase in the total number of curing barns and buildings for dealing with the tobacco crop throughout the Colony.

(g) Fire cured and air cured tobacco was more extensively produced in areas suitable for these types of leaf.

(h) More active interest taken in improved furnace design and economy in fuel.

(i) Labour-saving methods and improved organisation of native labour received more attention.

(j) Few growers have planted trees with a view to replenishment of fuel requirements for future use.

(k) Increased acreage of vlei soils devoted to raising early crop of tobacco.

(l) Possibilities of irrigation being more generally considered.

All previous annual increase in the acreage has been either steadily progressive or has remained fairly constant until the season 1925-26, when it was almost doubled, and again in the season 1926-27, when the total acreage was more than double that of the preceding year's total.

The estimated acreage under tobacco for the season 1927-28 again indicates approximately another 100 per cent. increase.

Such rapid additions to acreage can only be considered sound when marketing facilities are commensurately increased.

Difficulties are sure to be experienced by all concerned in the tobacco industry should there be any further extensive and rapid increase in the area of land planted to the crop before suitable marketing arrangements are established to absorb the additional production of tobacco entailed by any further increment in acreage.

We find that, until the latter half of the year 1927, most tobacco producers displayed a spirit of great optimism, and, in many cases, an inclination to gamble in tobacco, the chief reasons for this state of affairs being the satisfactory prices obtained for the previous season's crop and the excellent yields obtained during the 1926-27 season, as a direct result of which there was a general "doubling up" of acreage and corresponding increase in erection of barns and other buildings for housing the crop. After having already incurred this additional expense and preparation for increased production, growers were faced with a steady decline in the sales and a corresponding falling off in the price offered for their leaf.

Briefly, it may be stated that production has outstripped marketing facilities, and whilst a serious reduction in output cannot be regarded as being altogether desirable, it is extremely important that the present acreage be not further increased until there is an active demand for the whole of our present output.

The present surplus of tobacco remaining unsold, roughly estimated to be between six or eight million lbs., whilst not to the immediate advantage of the producers concerned, may be regarded as being of distinct benefit to tobacco buyers and manufacturers in England.

Manufacturers should now find it possible to select the desired types of tobacco to meet their individual requirements and feel more security in regard to sufficient tobacco being available for their trade requirements. Until recently there was no certainty as to the continuity of supply of our leaf, and this has probably been largely responsible for the cautious policy adopted by manufacturers in the use of Rhodesian tobacco.

A point repeatedly stressed by the officers of the Tobacco Branch is the matter of producing quality rather than quantity, and while the production of quality is receiving due attention by individual growers, this question is not receiving the consideration it merits by the producers as a whole.

It has been noted that extensive acreages on individual farms are generally obtained at the expense of quality in the tobacco produced.

It behoves all producers to attach the greatest degree of importance to the quality of their leaf, as competition with other tobacco-producing countries is growing rapidly, and will become more intense as time progresses.

The "get-rich-quick" attitude which has been evident in many quarters this year is to be deprecated, for when acting on this impulse many have rather exceeded the bounds of their available capital. This tendency to go beyond the reasonable limits of available finance greatly hampers the arrangements for the following season's crop, and renders more urgent the sale of the crop immediately after it is prepared for marketing. Under the above circumstances there is also an inclination to rush the crop through the barns by harvesting immature leaf, crowding the barn beyond normal capacity, and hastening the curing in order to forward the tobacco for sale at the earliest possible opportunity. The adoption of diversified farming would provide a more regular income for the majority of farmers. It is not intended to level any undue criticism at the tobacco growers of this Colony, and the foregoing remarks are made only to indicate certain tendencies which have been in evidence during the year under review.

Generally speaking, the production of the crop is being carried out along more advanced lines than was the case a few years ago, and more active interest is being displayed in such matters as improved furnace design with a view to efficiency and fuel economy, labour-

saving methods and more efficient organisation of native labourers, and in the erection of suitable tobacco barns and buildings. The old thatched roof is rapidly disappearing, and is being replaced by corrugated iron, which is now being extensively employed for roofing tobacco barns and buildings.

The production of Turkish tobacco has remained almost constant for the past nine seasons, and until an overseas market is definitely established the acreage devoted to this type of tobacco is not likely to be much increased. A shipment of Rhodesian-grown Turkish tobacco was exported to England this year, and should this trial consignment prove a success, it is possible that increasing quantities will be exported in the future.

The possibilities of dark fire-cured leaf are being more fully realised in those areas where soil and climatic conditions are suitable for this type of tobacco. The fire cured crop grown in the 1926-27 season proved very successful, and was readily disposed of.

The acreage under air cured tobacco was considerably increased, with fair results in so far as production was concerned. The marketing of the leaf, much of which was of inferior quality, however, proved somewhat difficult, and many growers still have their crops left on hand.

If air cured tobacco is to be produced on any extensive commercial scale, the growers will require to erect suitable buildings for curing and handling this class of leaf. The primitive style of buildings used for the air cured crop this year is not considered suitable for the purpose of producing a high grade product. Exposure to the wind and weather resulted in much damage to the tobacco cured by this method.

The two bacterial diseases, angular leaf spot (*Bacterium angulatum*) and wildfire (*Bacterium tabacum*), were not very prevalent during the season. The treatment of tobacco seed and other precautionary measures were generally adopted throughout the country. The absence of these serious diseases, however, may principally be attributed to the climatic conditions being unfavourable to the spread of the disease. The above unfortunately did not apply to mosaic disease, which was observed to be very prevalent, and spread over a greater area than previous seasons. This disease is fast becoming a serious menace to the tobacco crop in this country, and is taking an increasing toll of the crop annually. Up to the present mosaic has not been regarded by the majority of growers as a serious disease, and for that reason few methods of control have been practised. A portion of the crop was planted late in the season, and, contrary to the usual experience, the major portion of these late plantings reached maturity and cured out satisfactorily. However, there was a fair quantity of tobacco planted very late in the season which was destroyed by the severe frosts which were experienced in many parts of the Colony.

The white mould (*oidium*) made its appearance in the month of March and affected many crops, especially those which had been planted late in the season.

Trial crops were planted early and grown on wet vlei soils with natural drainage. Further trials are necessary over a period of years before a definite decision can be arrived at regarding the advisability of making a regular practice of growing tobacco on this class of soil. The possibilities of irrigation for establishing the crop in the field and during dry weather are attracting more attention in certain areas. Irrigation could be usefully applied to tobacco land and utilised for transplanting a certain portion of the crop a little while in advance of the time the rains are normally expected. The crop would also benefit by the application of irrigation during excessively dry weather experienced in the growing season.

The development of the industry is steadily progressing in Matabeleland, and in the Midlands where tobacco has only recently been grown on a commercial scale. The crop is now being produced in every district, with the exception of Wankie and Belingwe, open to occupation by Europeans. Where the soil and climatic conditions are suitable, there is every indication of the tobacco becoming one of the main crops in those areas where it has not already been established as such.

In summing up the results obtained this season, it may be stated that the year 1927 has proved to be a record one for the tobacco industry in Southern Rhodesia.

D. D. BROWN,
Tobacco and Cotton Expert.

Annexure "K."

Report of the Mycologist for the Year 1927.

For the period 13th June to 21st October I was absent on leave, and the laboratory closed down. My report therefore covers the remaining period of eight months.

Travelling.—Thirty-five farms have been visited.

Publications.—Five articles have been written for the *Rhodesia Agricultural Journal.*

Two hundred and seventy-nine lots of material have been examined and reported upon. From these, 29 diseases have been recorded for the first time in Southern Rhodesia. The majority of investigations has concerned tobacco and citrus, but several important diseases of cereals and deciduous fruit are worthy of note.

Tobacco.—The principal diseases affecting this crop in Rhodesia were white mould (*oidium* sp.), angular spot (*Bacterium angulatum*), wildfire (*Bacterium tabacum*), frog eye (*Cercospora nicotianae*), mosaic and nematode (*Heterodera radicicola*), of which the most destructive was white mould. The dry climatic conditions prevailing during the early part of the year were unfavourable for the development of bacterial leaf spots, so that the depredations of wildfire and angular spot were markedly reduced. Their distribution was, however, widespread. White mould made its appearance early in the season, and was particularly severe in most parts of the country, due to the rapid spread of disease as a result of copious spore production induced by dry conditions. It was noticed that infected leaves became a pale yellowish-cream colour prior to the formation of spores, and it was found that good control of the disease could be obtained by the removal and destruction of these leaves immediately the symptoms appeared.

Loss from frog eye disease was insignificant, only one case of extensive damage being noted in a field of late planted tobacco on medium-heavy red loam.

Much avoidable loss from mosaic resulted from the popular conception amongst growers that the disease was non-infectious. Instances were observed of its dissemination throughout an entire crop during the operations of priming and cultivating. It was found, however, that more care was taken to keep the disease in check during the beginning of the 1927-28 season, and it appears that the amount of disease has diminished.

Root gall-worm, or nematode, was of general distribution, but few cases of severe infestation were reported; the pest apparently being more prevalent in the sandy soils of Matabeleland than in Mashonaland. It is gratifying to note that farmers are striving to eradicate the pest by introducing crop rotations of two-years' maize and one-year velvet beans.

The 1927-28 season is characterised by the unusual prevalence of wildfire. So far in every case observed original infection has been traced to the seed beds, and investigations are being carried out to test the efficacy of the present system of seed sterilisation.

Citrus.—A disease of oranges which has appeared from time to time upon citrus estates in this country has been investigated at Mazoe.

It is characterised by small brown markings in the pits of the rind, and is referred to as "pit marking." In severe cases the spots coalesce to produce a bronzing of the surface of the fruit, usually at the blossom end, which renders it useless for export. Considerable time has been spent in the examination of diseased material, and it is now certain that the affection is of a physiological nature. It is found that rarely more than three layers of cells are affected. These are filled with a brown amorphous deposit, which appears to consist of oxidised fats. From general observations it is suspected that the disease is induced by dry weather conditions, and irrigation experiments will be carried out during 1928. In fertiliser trial plots it was found that there was no correlation between amount of disease and the presence or absence of any soil constituent.

The poor development of some 2,000 orange trees during the last five years has been found to be due to severe nematode infestation of the roots, whilst several fruit diseases have been shown to be identical with those commonly occurring in other countries.

Enquiries made in England in conjunction with Dr. Barker, of the Cambridge Low Temperature Research Station, have thrown light upon the incidence of certain diseases of stored fruit.

Cereals. — Few diseases of cereals have been reported. Rust of wheat and barley, which appears to be identical with *Puccinia graminis*, has caused some damage, but has not assumed serious proportions. Smut of oats is of common occurrence, but has been found to be adequately controlled by formalin seed steeps. Blindness in barley has been serious in a few isolated cases, and is thought to be due to the puncture by small sucking insects of the immature seed.

Deciduous Fruit.—Numerous well-known diseases of apples, peaches, plums, grapes, etc., have from time to time been recorded, the most commonly occurring being bitter rot of apples, which it is found may be controlled by applications of Bordeaux mixture.

Work has been carried out upon a disease of grapes, and an unidentified fungus has been isolated. The investigations are being continued.

Other Fruits.—Anthracnose and bacterial blight of mangoes are frequently observed, and anthracnose of paw-paw is also common. The latter fruit also appears to suffer from sun burn and frost to some extent, the climatic conditions of the high veld being rather unsuitable for good development.

Forestry.—A fungus which appears to be identical with the *Rhizoctonia* stage of *Macrophomina phaseoli* (Maubl.) comb. nov. has been isolated from roots of dead *Eucalyptus* sp., and it is possible that this organism may be intimately concerned with the frequent death of gum trees throughout the country. Further work will be carried out to confirm or disprove this theory.

Conclusion.—Some of the most common and serious diseases which affect tobacco are to be found well distributed throughout the country. It is notable that no serious root disease other than root gall-worm has been recorded.

With the greater expanse of tobacco culture in Southern Rhodesia an increase in the prevalence of diseases may be expected, but there is no reason to believe that these may become a serious menace to the industry, provided that control measures which are advocated be faithfully carried out.

Other well-known diseases of economic crops have been reported, but these may be kept within reasonable bounds in most cases by simple routine methods.

A complete list of important and new diseases recorded during the year is being compiled and will be sent to the Director of the Imperial Bureau of Mycology for his information.

J. C. HOPKINS,
Mycologist.

Annexure "L."

Report of the Forest Officer for the Year 1927.

Introduction.—The events of outstanding importance occurring during the year are the increased appreciation of the value of forestry by all sections of the colonists and the purchase by the Government of a tract of elevated land, in extent 18,477 acres, in the Umtali district for afforestation purposes.

The general public is giving increasing attention to the protection and utilisation of the indigenous forests and the planting of timber-producing trees of exotic species.

The purchase of the Stapleford Ranch completes the main programme of State forestry—a policy capable of indefinite expansion—in so far that the State effort in forestry now embraces the three main types of climatic conditions where Europeans can live in comfort.

Type I. is represented by the Stapleford Forest Reserve. This is a zone situated along the eastern border having a comparatively high rainfall (over 40 inches) fairly well distributed throughout the year. In this zone a large range of valuable softwoods—pines, cypresses and other conifers—can be grown. Many valuable hardwoods also thrive.

Type II. is represented by the Mtao Forest Reserve, where the mean rainfall is between 30 and 40 inches, more or less confined to the summer months. This zone roughly embraces the portions of Mashonaland occupied by Europeans. In this zone a range of the more hardy hardwoods as well as softwoods can be grown.

Type III. is represented by certain Government-owned Savannah Forests on the Kalahari sand formation. The mean rainfall is below 30 inches, and is chiefly the portion occupied by Europeans in Matabeleland.

In the Kalahari sand areas no area has yet been definitely set aside as a forest reserve, but steps have been taken during the past three years to protect the forest areas where certain timber companies are operating. The 1925 Land Commission recommended that an area of 670,000 acres in the Nyamandhlovu, Bubi and Wankie districts be set aside as a Forest Reserve, and it is hoped that this will materialise. In these areas valuable indigenous hardwoods thrive and regenerate themselves freely.

The European labour scheme at Mtao continues to make good progress. The behaviour of the men has, on the whole, been good. On the 1st January, 1927, there were 34 men in the camp. During the year 70 men reported for work and 65 departed, leaving 39 as the strength on the 31st December.

Many men on account of age are not able to do the hard work required, but as far as possible suitable employment is found. As the plantation extends a wider range of employment offers, and light work, such as pruning, can be carried out by the older men.

State Forests.—The area of State Forest Reserves now comprises:—

	Acres.
Forest Nursery, Salisbury	100
Mtao Forest Reserve	15,498.37
Stapleford Forest Reserve	18,477.05
	34,075.42
Gwaai Forest Reserve (proposal) ..	670,000
Total	704,075.42

The officers of the Forest Service act in an advisory capacity, and supervise, as far as the small staff permits, the operations of the timber companies in the Crown forests situated in the Nyamandhlovu, Bubi and Wankie districts. These forests are several thousand square miles in extent.

The forests on the Kalahari sand areas are of great potential value, and it is hoped that ultimately they will be created permanent State Forest Reserves.

Fencing.—During the year the eastern boundary of the Mtao Forest Reserve adjoining the farms "Good Hope" and "Aldeby" was fenced. The length is 3 miles 1,158 yards. Adjoining private proprietors bore half the cost.

General Management. — At the Mtao Forest Reserve the outer boundaries have been kept open. Areas planted to trees are in numbered compartments.

For purposes of management, the Kalahari Sand Forests have been divided into four working sections. No. 1, Masue, embraces the area where the Falls Timber Syndicate is operating. No. 2, Fuller-Kesi (Zambesi Saw Mills, Ltd.). No. 3, Umgusa (Rhodesia Native Timber Concessions). No. 4, Malindi and Intundhla (Rhodesia Native Timber Concessions).

Maps of the first three working sections have been prepared. The working sections are being divided into blocks either by using existing roads, or where these are absent, by cutting open arbitrary lines. These boundaries serve as fire belts and communications.

All areas as they are exploited are marked on the maps, together with dates of extraction and volume of timber removed.

For purposes of control, the various operations undertaken during the year at the different centres are detailed in annual plans of operation. At Mtao the prescribed work fell behind on account of the shortage of labour, but special efforts in recruiting labour eased the position somewhat, and lost ground is being made up.

Valuation Surveys.—As far as opportunity occurs, maps are being prepared and data collected as to stocks of timber in the various Savannah forests. During July-October the Assistant Forest Officer, Matabeleland, was engaged in the study and valuation of private forests in the Nyamandhlovu district. Data of great value were collected.

Protection.—During the year the usual precautions, such as burning of fire belts and the maintenance of a staff of fire wardens, were taken to protect the forests from fire.

The protection of the large area of Savannah forest in the Nyamandhlovu, Bubi and Wankie districts is a problem of some magnitude. Owing to the limited European staff, the forests were divided into blocks averaging 20 square miles. These were protected by means of wide fire belts and patrolled by native watchers during the fire season.

The areas surrounded with fire belts are as follows:—

Working section	Protected 1926		Protected 1927		Increase	
	Sq. miles	Acres	Sq. miles	Acres	Sq. miles	Acres
Fuller-Kesi	79.77	51,053	90	57,600	10.23	6,547
Umgusa	204.49	130,938	205	131,200	0.51	262
Masue	169.37	108,397	240	153,600	70.63	45,203
Totals	453.63	290,388	535	342,400	81.37	52,012

The year under report proved an exceptionally dry one, with heavy frosts in the winter, and notwithstanding the precautions taken, severe fire damage has to be recorded not only in the Kalahari sand areas, but throughout the whole country.

In the Kalahari Sand Forests the Fuller-Kesi area was burnt over to the extent of 43.3 per cent., Umgusa 41.4 per cent., and Masue 13.7 per cent. The causes of these fires were:—80 per cent. due to natives and 20 per cent. from fires originating in the railway strip and crossing the insufficiently burnt railway fire belts. Most of the fires started outside the protected areas and crossed the fire belts. Owing to the absence of the Assistant Forest Officer on seconded duty during July to October, the burning of the belts had to be left to the native wardens, who are not yet sufficiently trained to carry out the work in an efficient manner. The fires which occurred in the Masue area all occurred before the appointment of a Forester. The experience gained during the year indicates that successful fire protection cannot be obtained without European supervision. The native labour force is still unstable and inefficient and the native mind has, as yet, been quite unable to grasp what protection really means to the forest both as regards the soil and the trees.

Careful study of the Kalahari Forests indicates that the present Savannah type is the result of annual or periodic fires. Where fires have been excluded over a period of years the forest gradually reverts to the original close type with the Rhodesian teak (*Baikiaea plurijuga*) as the dominant tree. This close type is not ordinarily susceptible to fire injury, as is shown by the fact that where patches of pure teak occur the fires tend to sweep round them and leave the trees uninjured. Sufficient data are not yet available to indicate the period of time rigid protection is necessary, but a study of the succession of tree and shrub growth indicates a short period of about 10 years.

At the Mtao Forest Reserve protection was not as successful as during the previous year, when no fires occurred. Three fires burned over an area of 6.5 per cent. One fire occurred through the fire belt burning operations getting out of control. The other two fires were caused by native trespassers gathering honey. Considering the very dry year and heavy frosts, the result of fire protection is better than was anticipated.

At Mtao the plantations of exotic trees are subject to attack by spring hares, but the erection of low brushwood fences, supplemented by shooting, are effectual preventative measures. In the Kalahari sand areas the presence of wild animals far outweighs the slight damage they do to tree growth. It is considered that large herds of game are a very real check to fires.

The low rainfall caused a few losses among exotic trees at Mtao. In the Kalahari sand area the low rainfall expressed itself in early leaf-fall, thus opening the forest floor to the drying effect of the sun and hastening the susceptibility to fire damage. Frosts of unrecorded severity occurred, causing injury to many species of trees.

Injury caused by insects was not of a serious nature, though defoliation of several species of indigenous trees was common over wide areas.

SYLVICULTURE.

(a) **Natural Regeneration.**—In the indigenous forests, owing to the low rainfall, natural regeneration was not as abundant as in years of good rainfall. In the plantations of exotic trees, trees are not of sufficient age to desire natural regeneration.

(b) **Artificial Reproduction.**—

1. Indigenous Trees.—Tests with important indigenous trees were continued. Seedlings of *Baikiaea plurijuga*, *Afzelia cuanzensis*, and *Copaifera coleosperma* sown in lines last year have survived as follows:—Baikiaea, 85 per cent.; Afzelia, 50 per cent.; Copaifera, 10 per cent. Sowings in November, with no waterings except rainfall, gave the following results:—Baikiaea, 90 per cent.; Afzelia, 70 per cent.; Copaifera, 70 per cent. In all cases germination was still taking place at the end of the year.

2. Plantations.—To test the conditions at Fuller Siding, several species of exotic trees were planted experimentally. The transplants were of poor quality and weather conditions were unfavourable. Survivors indicate that with a good planting season the following should establish themselves, namely:—*Euc. rostrata*, *Euc. tereticornis*, *Euc. melliodora*, *Euc. sideroxylon*, *Euc. crebra*, *Euc. paniculata*, *Callitris glauca* and *Callitris calcarata*.

Afforestation operations during the year are as follows:—

Locality	Afforested area at end of 1926	Afforested during 1927	Total area afforested as at 31/12/27
	Acres	Acres	Acres
Forest Nursery, Salisbury ...	36.5	...	36.5
Mtao Forest Reserve	300.5	155.0	455.5
European Relief Works, Mtao ...	59.5	121.5	181.0
Totals	396.5	276.5	673.0

Cultural Operations. — Experiments to determine the best methods of establishing plantations have been continued. The plantings during the year under report were in soil which had been stumped, ploughed and harrowed. The young trees were planted in holes in which good top soil had been placed. Excellent results have been obtained, despite the low rainfall.

Nurseries and Sales of Seeds and Transplants.—The sales from the Forest Nursery at Salisbury exceeded those of any previous year. During the year, 1,510 orders were dealt with. The number of transplants supplied amounted to 322,812 and seed disposed of to 360 lbs. 2 ozs. The nursery stock on hand on 31st December was 287,200 transplants, valued at £1,403 7s. 5d., and 222 lbs. seed, value £163; total, £1,566 7s. 5d.

The nurseries at the Mtao Forest Reserve have been maintained. At the Fairfield Nursery, by using good labour, the labour cost of raising plants has been reduced from 8s. 11d. to 5s. 9d. per 1,000. The Fairfield Nursery distributed 318,653 transplants, and at the end of the year had a stock on hand of 407,000, valued at £1,101 18s.

The nursery at the European relief works distributed 147,000 transplants, and at the end of the year had a stock of 220,000, valued at £594.

A nursery at the Stapleford Forest Reserve will be commenced during the ensuing year.

Sylvicultural Notes. — In view of the importance and potential value of the Kalahari sand forests, various improvement fellings were carried out by "sapping" undesirable species. An area of 4,900 acres was dealt with, at a cost of 8d. per acre. At the Mtao Forest Reserve tests of new species continue. Among the earlier planted trees a number are outstandingly good, particularly among conifers such as *Pinus insignis*, *Pinus patula*, *Pinus taeda* and *Pinus pinaster*. Should the good growth be maintained, of which there is little doubt, on account of the very deep sandy soil, the reserve becomes a national asset of great value.

Exploitation.—In the Kalahari sand areas operations are carried out by various timber companies. Since the Forest Service has been able to supervise felling operations, wasteful methods are being checked. At present operations are primarily for the production of railway sleepers, and as a result of this it is estimated that 50 per cent. of the timber felled is left in the forest. Of the balance which reaches the mills, only 50 per cent. is utilised and exported. In these areas, for a period of 10 years ending June, 1927, nearly 3½ million cubic feet were exported, for which the

Government has received a little over £28,000, equal to a royalty of about 2d. per cubic foot. During the year four stationary and one portable mill were in commission. The total output was in the neighbourhood of 500,000 cubic feet of sawn timber.

Private Forests.—The year has seen a great increase in interest in the forestry movement, and considerable time has been given by the Forestry Staff to general advisory work. Among the farming community the rapid development of the tobacco industry has shown that the existing timber and fuel supplies are not inexhaustible, and numerous tree-planting operations have been taken in hand or extended. Various companies are investing capital in purchasing land for afforestation propositions or planting trees on properties which they own. Indigenous forests are being conserved as well as exploited on business lines.

Forest Officers have given addresses at numerous farmers' meetings and visited large numbers of farms, where first-hand advice and guidance was given on different phrases of forestry. The public interest displayed is adding considerably to the forest wealth, and in time the Colony will be self-contained in regard to timber requirements, thus eliminating imports from foreign countries.

As the private forestry propositions extend, increasing demand is made on the Forestry Staff for professional advice, and to meet this as well as extend the national forestry schemes, an increase in staff becomes necessary.

The Publications during the year were:—(1) Bulletin on Timber and Fuel for Tobacco Growers, Yields from *Eucalyptus rostrata* and *Euc. tereticornis*, by J. S. Henkel. In *Rhodesia Agricultural Journal*. (2) Paper on the Indigenous Bamboo *Oxytenanthera abyssinica* (A. Richards) Munro, Gregarious Flowering and Natural Regeneration in Southern Rhodesia, by J. S. Henkel. In *South African Journal of Science*, Vol. XXIV.; December, 1927.

In addition, the Public Press gave extended references to addresses by Forest Officers, as well as publishing leading articles on the importance of forestry as a national asset.

The Forest Officer expresses his appreciation of the very valuable assistance given to him by his officers and foresters, and it is to their efficiency and devotion to duty that the success of the year's work is largely due.

J. S. HENKEL,
Forest Officer.

Annexure "M."

Report of the Botanist for the Year 1927.

Herbarium Collections.

The following sets of plant specimens were dealt with. By a set of specimens is meant two to six specimens of a species, each treated separately.

Sets of specimens preserved by treatment, recorded, numbered and labelled preparatory to distribution to specialists		716
Sets of specimens distributed to specialists for identification, as follows:—		
To Kew	734	
,, Imperial Bureau of Mycology	115	
,, Stellenbosch University	87	
,, Cape Town University	20	
,, Grahamstown Museum .	28	
,, British Museum	132	
,, Berlin	46	
,, Dixon, Northampton ...	5	
,, Oxford University ...	42	
	——	1,209
Names of plants received and recorded, as follows:—		
From Kew	324	
,, Stellenbosch University	91	
,, Bolus Herbarium ...	2	
,, Grahamstown Museum	3	
,, Dixon, Northampton	36	
,, Dr. Sim, Maritzburg	71	
,, Oxford University ..	7	
,, Pretoria	2	
	——	536
In the revision and correction of the Departmental collection, the following sheets of specimens were dealt with:—		
Provisional classification of sheets bearing no names .	506	
Specimens mounted, named and incorporated in herbarium ,, ...	397	
	——	903
Plants were submitted for identification by Entomologists, Agriculturists, Mycologist, Schools, Museums, Experiment Stations, Forest Office, Native Commissioners, Farmers and others, and names were supplied to them, the number being		170
Total		3,534

General.

Botanic Garden.—The Greenwood Park garden was visited from time to time; a number of the plants named and labelled; and specimens taken of new or unknown plants for incorporation in the herbarium and for submission to specialists in some cases.

Agricultural Journal. — One article, on noxious weeds, was written and published.

Bulawayo Municipal Council.—This body was advised in regard to different methods of dealing with a pest of mistletoe with threatens to destroy the trees on the Bulawayo commonage.

Departmental Collection. — The departmental collection of dried specimens, which is required for the identification of economic and other plants, is not as large and comprehensive as it should be. A revision of the collection was begun, that is to say, unnamed specimens are being named, wrongly labelled plants are being corrected, and plants not mounted, or badly mounted, are being properly mounted. It will take several months to complete this revision, and when it is finished, a systematic survey of the flora of the country should be undertaken, in the course of which additions to the official collection should very soon far exceed the total now in the Herbarium. Hitherto the Botanist has relied on the "Eyles Loan Collection" for identification purposes, and the removal of that collection will emphasise the necessity of building up a comprehensive departmental Herbarium.

F. EYLES,
Botanist.

Annexure "N."

Report of the Editor, "Rhodesia Agricultural Journal," for the Year 1927.

The *Rhodesia Agricultural Journal* has now attained a sound position, not only in this Colony, but among the Agricultural Journals of the world.

The recent rapid growth of the Colony has focussed a large amount of attention on our progress, and as the official publication of the Agricultural Department our published experience, data and technical articles have an added significance.

It is pleasing to note that the bulletin service is being utilised to an increasing extent.

That the *Journal* is fulfilling a real need in the Colony can be adduced from the fact that it has been necessary to increase the number of copies printed three times within the twelve months, the increase of paying subscribers amounting to approximately 14 per cent.

The general and proved policy of disseminating technical knowledge in an easily assimilable form has been continued.

The number of subscribers at the end of December was 2,092.

As compared with the previous year, while the cost of printing increased by 16.70 per cent., the revenue increased by 20 per cent., showing a decreased call on public funds.

EDWARD H. BERRY,
Acting Editor.